THE
ELECTRICAL REVIEW.

VOL. XCI. SEPTEMBER 1, 1922. No. 2,336.

ELECTRICAL REVIEW.

Vol. XCI.] CONTENTS: September 1st, 1922. [No. 2,336.

	Page
Supply Pressures	289
Contracts and Patent Infringements	290
The Turning Tide	290
The Electrical Industrial Situation in Sweden	290
German Exports	291
Dangerous Lifts	291
The South African Market for Domestic Appliances	291
The British Association	291
Glasgow Tramway Contract	291
Aspects of the Most Economical Transmission-line Design, by William T. Taylor	292
Estimating for Internal Wiring Contracts, by Alan Kirk	294
The Loading of a Current Transformer	295
The Ramsay Turbo-electric Locomotive (*illus.*)	296
Insulating Materials	297
A New Telegraph System (*illus.*)	298
The Electricity (Supply) Act, 1922	299
New Electrical Devices, Fittings, and Plant (*illus.*)	300
Ferguson-Pailin Armourclad Switchgear (*illus.*)	301
Correspondence—	
The Lightning Conductors of the County Hall	302
Making Hay the Electric Way	302
Business Notes	303
Notes	310
City Notes	313
Stocks and Shares	314
False Marking and Description of Goods, with Special Reference to Origin.—V. By Theodore Rich	315
The Anglo-Dutch Telephone Cable (*illus.*)	317
Practical Applications of the Johnsen-Rahbek Effect (*illus.*)	318
Duplex Wireless Telephony (*illus.*)	319
Electricity Supply for the S.E. & C.R.	321
Reviews	322
The Trade Union Clause in Contracts	323
New Patents	324
Published Specifications	324
Contractors' Column	Advertisement page xxviii

"ELECTRICAL REVIEW" SUBSCRIPTION RATES.

UNITED KINGDOM	**£1**	**14**	**8 per annum.**
CANADA	**1**	**12**	**6 do.**
COLONIAL and FOREIGN	**2**	**1**	**6 do.**

Postage Free.

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 6d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE, 4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGEEKAY, CENT., LONDON." Code, A B C.
Telephone Nos.: Central 8260 and 8261.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 8, Warren Street.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Ditta P. Maglione & C. Strini, 88, Via Due Macelli.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt St.
TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.
TORONTO, ONT.: Wm. Dawson and Sons, Ltd.; Manning Chambers; Gordon & Gotch, 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "London Joint City and Midland Bank, Newgate Street Branch."

SUPPLY PRESSURES.

IN a letter to the *Electrical World* of July 29th, Mr. L. H. B. Sandwell asks: "Why do America's public utility undertakings use up copper four times as fast as is necessary? Is there any good reason why this must continue?" There is a very good reason, which the Editors append to his letter; admitting the truth of his contention that by distributing electricity at 110 volts the supply undertakings have incurred an excessive outlay on copper in their mains, they regretfully point out that the United States has standardised on the lower voltage and cannot now make the change, on account of the enormous investment in apparatus working at that pressure.

In this respect most other countries have almost entirely rejected American practice; the battle of the pressures was fought out many years ago, when lighting was the predominant element in the electricity supply industry, and pressures round about 220 volts were almost universally adopted for domestic supply. Not only did this pressure meet almost every household requirement—it also facilitated the adoption of electrical power at 440 volts, and enabled the same generating plant to be employed for traction. We know that Mr. C. H. Wordingham favours the lower voltage, but his arguments are based mainly upon the question of personal safety, and with due respect for his opinion, we believe the records of the past 25 years afford but little support for misgivings on this score. It is obvious that the highest safe pressure is also the best pressure from the technical point of view, for it implies the use of the smallest current and consequently the minimum size of cables and accessories; the fact that 220, and even 250, volts can be successfully dealt with in lampholders and lamp-caps, where the live parts are separated by only 3/16 inch, proves that the pressure is not too high for general use, and the remarkable achievements of the lampmakers in producing reliable metallic-filament lamps that take only 20 watts at 220 volts have similarly disposed of the objection that low-candle-power lamps could not be made for that voltage. We grant that 100-volt m.f. lamps would have a higher efficiency and a longer life; but the difference is not so great as to counterbalance materially the many advantages of the higher pressure, which have been greatly emphasised by the development of the domestic heating and cooking load.

It will be remembered that at the I.M.E.A. Convention of 1920, Mr. C. A. Gillin foreshadowed a possible increase in the pressure of domestic supply, to cope with the growing demand; we think, however, that it will be generally agreed that this proceeding would be very undesirable—the limit of 250 volts set by the Board of Trade was well chosen, and should never be exceeded.

On the whole, we think our engineers did wisely when they changed over to 200-250 volts, and we may congratulate ourselves upon being in a much more satisfactory position in this respect than our transatlantic friends.

Contracts and Patent Infringements.

It is usual, in contracts for the purchase of new plant and also in the conditions of sale covering such plant, to embody a clause indemnifying the purchaser against loss caused by any action for infringement of patent rights arising out of the use of the plant.

The clause ordinarily states that in the event of any claim being made or action being brought against the purchaser in respect of infringement of patents by the manufacture or sale of goods supplied under the contract, the purchaser is to notify the manufacturers or vendors immediately. The vendors shall then be at liberty, with the purchaser's assistance if required, but at the vendors' expense, to conduct all negotiations for the settlement of such claim or any litigation that may arise therefrom.

It will be noted, also, that the clause states that the vendors will indemnify the purchaser in respect of any such claims.

It should be borne in mind, however, that in the event of financial instability on the part of the vendors the claims or the expenses of any litigation in which the purchaser might become involved might prove to be considerably in excess of any retention sum, held by the purchaser, on the contract. Further, in such a case it is highly probable that the holder of the patent rights would take action against the purchaser as user of the infringing device in preference to taking action against vendors who might choose to go into liquidation or otherwise evade their responsibilities.

Remedial action under the law covering infringement of patent rights is somewhat unwieldy; hence it tends to prevent unnecessary and vexatious actions being started, and not infrequently makes it difficult for a patentee to maintain his rights. On the other hand, however, in some respects the protection afforded the patentee is far-reaching. It is laid down that not only is a limited liability company liable to have an action brought against it as user of an infringing portion of plant, but each and every director of such company can be joined in the action, as they are equally liable as joint *tort feasors*.

In the event of the purchaser being an innocent infringer, cause for action would still lie against him as such, and an injunction might be obtained to restrain him from using the infringing plant. This might result in very serious hardship to a company which was relying upon such plant to maintain continuity of supply, but it would be open for it to secure an individual licence from the holder of the patent rights to enable it to continue the use of the infringing plant. The Comptroller of the Patent Office has power to cause such licence to be granted upon reasonable terms, and the procedure is rather simpler in the case of patents which have been endorsed in the register with "Licences of Right."

As the arbitration clause in most contracts provides for the settlement of "any question in dispute or difference whatsoever," it is usually preferable for a purchaser, who has contracted with vendors of meagre resources, to endeavour to secure the agreement of such vendors to arbitration. The referee in such arbitration as is provided for is usually as competent to adjudicate, with expert assistance, upon any but the most involved patent cases as either of the Higher Courts in which action might be brought. Furthermore, it would safeguard the purchaser from having to defend an action for injunction wherein he might ultimately find himself saddled with the whole of the costs, a by no means small matter, if the financial resources of the other parties to the action proved to be inadequate.

Such procedure as is outlined above would tend to lessen the amount of expensive litigation which often arises out of comparatively simple cases, and is in line with the recently expressed opinion of Lord Buckmaster, who stated that some new methods of determining disputes about scientific inventions were needed.

The Turning Tide.

Whilst the process of trade recovery is painfully slow, we believe it is sure. A rapidly rising barometer does not foretell fair weather but a storm; it is the slow, steady rise that justifies an optimistic forecast, and similarly we look upon the gradual improvement that is taking place in industry as a most promising sign of stable conditions and the passing of the clouds which have so long brooded over the land. On all hands we meet with hopeful opinions. On Monday, for instance, on one page of a financial contemporary we read of the "Turning Tide in Ulster—Steady Recovery"; "Shipbuilders Optimistic"; "Optimism in Scotland"; "Strong Demand for Coal"; "Better Trade Forecast—Improving Demand"; "Reduced Unemployment," and so on; and though there are less cheery items on the same page, the general tone of this and other journals concerned in industrial movements indicates the feeling that the tide is flowing again.

When we bear in mind that we are making upward progress in spite of the heavy handicap imposed upon our trade by the chaotic conditions prevailing over large areas of the Continent, the depressed state of many of our other markets, and the disturbances which from time to time invade our own industrial field, we cannot but congratulate ourselves upon the state of convalescence that we have already reached, and look forward with strengthened confidence and unshaken faith to the day when Britain will once more rejoice in abundance of trade, work for all, and prosperity for every class of her population.

The Electrical Industrial Situation in Sweden.

The Swedish electrical market was formerly almost wholly worked by the German electrotechnical industry. In late years it has gradually slipped away from that country's grasp, as an outcome, it is said, of irregularities in the supply of goods and of the fluctuations in prices. At the present moment, according to an article in *L'Electricité pour Tous*, German firms are making vigorous efforts to recover the outlets of which they had formerly an assured hold, and an extraordinary advertisement campaign is being engineered, while a German invasion of travellers and agents is under way. The establishment in Stockholm of a German trade information office and permanent exhibition of samples is even mooted, and a reconquest may perhaps attend these steps; but for the moment results are merely shadowy.

Sweden, however, while shunning Germany, is turning towards England. The mechanism of this phenomenon is easy to understand. Outlets are being sought in England which are not to be found in Germany, on account principally of the currency difficulty, and therefore to make sure of these outlets Sweden opens wide her ports to importations from England. Swedish electrical industry made big strides in development during the war, and the manufacture of many machines of the smaller and medium sizes has visibly progressed. Nevertheless, for large sets Sweden has remained dependent on Germany, and it is for these that she may become the customer of other countries. The plant for which she will make the greatest call is that needed for the working of mines and the installation of foundries, steelworks, paper mills, &c. The extension and improve-

ment of the equipments of the ports of Stockholm, Gothenburg, Malmo, &c., are also contemplated. A large portion of these plants is electrically driven. Electric stations and transmission and distribution networks are very numerous, and the use of electricity in all branches of industry is widespread, and all this progress and development implies large purchases of the bigger items of electrical plant. The conversion to electrical operation of several lines of railway is proceeding, but still more extensive schemes have had to be laid aside on account of the prevalent financial depression and the variations in the price of coal. This is the case, for example, with the Stockholm-Gothenburg line; but the works on the Kiruna-Svartsön line are being prosecuted.

In the wireless department it has been decided to build a powerful station capable of ensuring a regular service between Sweden and America. The various systems have been under consideration—French, English, German, American—and as we announced last week, the Radio Corporation of America has received the contract. The establishment of a link between Sweden and Finland is also contemplated. The Swedish Wireless Co., of Stockholm, has joined with the Marconi Co., and worked out a programme to establish wireless connections throughout the interior. Recent telephone departures include the laying of a cable between Sweden and Germany; and another cable, between Stockholm and Gothenburg by way of Västeras, Koping, Orebrö, Sköfde, and Allingsas, is in course of being laid. Two big companies making telephone material, the Ericsson and the Cedergren companies, have amalgamated, in order to extend their activities.

German Exports.

A German newspaper seeks to show that, contrary to the idea prevailing in certain other countries, the export trade has not been very active owing to the depreciation of the mark since the conclusion of the war. Taking the German official figures, it is stated that the exports of machinery averaged 540,000 tons in the years 1911 to 1913, while in the twelve months ended with June 30th, 1922, the exports amounted to 410,000 tons. The corresponding quantities for electrotechnical products are 125,000 tons and 90,000 tons respectively. If the exports for one month only are taken into consideration, it is shown that 36,500 tons of machinery and 6,500 tons of electrotechnical products were exported in June, 1921, these figures comparing with 41,000 tons and 7,700 tons respectively in June, 1922.

Dangerous Lifts.

Having regard to the highly-developed stage to which modern electric lifts and accessories have attained, it seems almost incredible that accidents such as that recorded in our "Notes" columns to-day can occur. The fitting of a simple gate-operated mechanism is not a very expensive or difficult matter, and it would be thought that all lifts installed before the introduction of such devices would by this time have been put right in this respect. It appears, however, that there are still cases in which safety has not yet been assured, and while this is so accidents are bound to occur through carelessness or inadvertency. It is essential that every lift system shall be so arranged that until all the gates on the system are closed it is impossible to start the lift, and that no gate can be opened until the lift is at that particular floor. Of course, no lifts are constructed without a safeguard against rope-breakage.

There are naturally objections to devices which secure the objects mentioned; it may be complained that over-refinement leads to complications and minor breakdowns which result in putting the lift out of action; again, the failure, in the case of automatic lifts, of passengers to close a gate may make it impossible for the lift to be "called" from another floor. But in spite of these objections it is incontrovertible that safety must even be placed before efficiency—where the two terms are not synonymous.

The South African Market for Domestic Appliances.

The position as regards the sale of domestic electrical appliances in Cape Town, as revealed by a report of the American Vice-Consul abstracted in our "Business Notes" this week, will be regarded by British manufacturers with mixed satisfaction. It is something to know that their goods are favourably placed in comparison with American appliances, but the Teutonic spectre is to be seen in the background. It is not surprising to learn that American toasters hold their own on account of superiority, for we have seen a number of British makes of very flimsy construction and poor finish at trade shows, although the more reputable makes are certainly not inferior to the American variety.

We think the claim of superiority thus advanced by America applies with even greater force when comparison is made between British and German manufactures, and on this score alone we think that British appliances will continue to hold their own in what is, after all, a British market.

The British Association.

The ninetieth meeting of the British Association for the Advancement of Science commences at Hull on Wednesday next, this being the second visit to the city after an interval of about seventy years.

Electrical subjects seem destined to play an ever-diminishing part in the Association's proceedings, and so far as we can learn at present, the study of electrical matters is confined to Section A—Mathematics and Physics—of which Prof. G. H. Hardy, F.R.S., is president. Papers dealing with X-rays are to be contributed by M. le Duc de Broglie and Prof. R. Whiddington, B.Sc. There will be an exhibition and description of physical apparatus employing electrical means for biological purposes, and Mr. J. E. P. Wagstaffe is reading a paper upon "The Determination of Dielectric Constants and Susceptibilities by Valve Methods."

One of the general discussions arranged in this Section is on "The Origin of Magnetism," to be opened by Prof. P. Langevin (Paris) and Prof. P. Weiss (Strasburg).

The president of Section G—Engineering—is Prof. T. Hudson Beare, and the subject of his address is "Railway Problems in Australia."

Section F—Economics (president, Prof. F. Y. Edgeworth)—is bound to be a source of some papers of general interest and utility, and the same may be said of Section J—Psychology (president, Dr. C. S. Myers, F.R.S.)—in which industrial or "applied" psychology is receiving a great deal of attention. One of the popular evening discourses this year is to be delivered by Dr. F. W. Aston, who takes as his subject "Atoms."

It is to be hoped that the weather and conditions generally will be as favourable as they were at Edinburgh last year.

Glasgow Tramway Contract.

We note with regret that the Glasgow Corporation, by a narrow majority, has accepted an American tender for tramway rails, effecting an apparent saving of £3,000. At a time when over a million British workpeople are unemployed, it is painful to see work sent abroad to "save" money which will have to come out of the pockets of the ratepayers in the shape of doles. The injury to the national interests is not confined to this consideration; idleness is demoralising and irksome to honest men, and the example set by Glasgow will result in other orders, both from home and abroad, being diverted from our workshops. We are glad that all the Labour members of the Corporation were alive to the meaning and consequences of this transaction, and did their utmost to prevent its accomplishment.

ASPECTS OF THE MOST ECONOMICAL TRANSMISSION LINE DESIGN.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

When designing a transmission line the object in view is, of course, the most economical transmission line. In practice, the actual results, more often than not, vary within a wide range from *the most economical* transmission line. The cause may be due to (*a*) an imperfect knowledge of this class of civil, of mechanical, and of electrical engineering; (*b*) lack of practical experience; (*c*) want of proper understanding of *all* the present and future independent and inter-dependent variable factors, &c.—in fact, the essential requirement is to be certain that every item entering into the problem of the most economical transmission line is receiving proper attention before any further step is taken. This is very often where the first great discrepancy is made, and, perhaps, added to it, there may be an inaccurate or an unsafe interpretation or an improper application of one or more of the varied and rather complex economic problems, technical details, &c. In the design of the most economical transmission line a number of assumptions and probabilities must first be made, some or all of which may offer avenues for a varying degree of discrepancies in the calculations upon which the transmission is to be designed. Moreover, seeing that the transmission line itself is but a part of the complete electric power system, the numerous economic problems involved may be seen to vary widely and to require the solution of many variable factors, difficult and sometimes impossible to solve to a fair degree of refinement.

In a general way, we do not take very kindly to the two following statements:—

(1) We have not designed and constructed the most economical transmission line because of the uncertainty of basic assumptions, &c., &c.; and

(2) That extreme refinement in calculations relating to the determination of the *proper* size of conductor, usually represents an unnecessary expenditure of thought and labour, in view of the fact that the final choice will in any case fall between two different standard sizes of conductors differing, appreciably in area, one or the other of which must be selected for commercial reasons quite independent of the *exact* size which theoretical calculation would show to be most advantageous.

Obviously, unless the designer is fully capable of solving, within a fair degree of accuracy (not necessarily extreme refinement), such problems as the best and most economical location, the most economical voltage, the most economical size of conductors, the most economical span between line supports, or the most economical phase correction or compensation, he is effecting no useful purpose in saying that the two above-mentioned statements do not apply to him, or that one or the other is wide of the mark. The writer's experience forces him to admit of much truth in the above statements, and also to admit that, in general, they are fairly well borne out in actual practice. As in the case of a railroad or a water conduit, our mathematical minimum or averages are made subject to circumstances, and our designs are made and the work is completed for conditions not in sight, and which, from time to time, call for changes in the original calculations, assumptions, probabilities, &c.

The most economical design of a transmission line is governed by many factors, the principal being load factor, transmission distance, cost of energy, and the annual expense of the investment. In general, big power capacity, high load factor, long transmission distance, high cost of energy, and low annual expense will result in a *high* most economical voltage; and, big power capacity, high load factor, short transmission distance, and low cost of energy will result in making the most economical size of conductors *large*. In the design of the most economical transmission line, the principal independent variables to be taken into account are:—(*a*) Distance of transmission; (*b*) amount of load; (*c*) nature of load; (*d*) cost of generating energy; (*e*) number of lines; (*f*) number of circuits; (*g*) factor of safety; (*h*) spacing of line supports; (*i*) electrical system; (*j*) transmission voltage; (*k*) spacing of conductors, &c.; (*l*) selling price of energy; (*m*) interest and depreciation, &c.

The cost of a transmission line consists of (1) the generating costs of energy lost in transmission; and (2) the allowances for interest and depreciation, &c., on the investment. By varying several independent variables, the cost will show a minimum for a *definite* power load (variable in practice) and *definite* transmission distance. The *real* problem is not purely a matter of solving for a theoretical minimum. The problem also demands practically an absolute security of service (best quality of the complete installation), as well as reasonably good line voltage regulation, &c. The former may mean (due to service requirements) a duplicate transmission line, a very high factor of safety, both electrical and mechanical, very high degree of protection against lightning and other disturbances, &c. The latter is always important, and is one of the requirements in the form of transmitted energy—its degree of variation will vary with the load.

Because of the large capital outlay involved in the transmission of energy over long distances in great bulk at very high pressures, it is very important to locate, design, construct, and operate the line in the most economical manner. Industrial, financial, and other conditions will change the cost of the complete transmission system, and the value of energy, &c., and the constants assumed in the calculation for the determination of the most economical conditions (involving wayleaves, line supports, conductors, insulators, earth wires, land, buildings, transformers, &c.) may differ at one time to another sufficiently to show that the original calculations are widely different from the actual practical conditions.

The electrical efficiency of a power transmission line depends upon (1) ohmic loss in the line conductors; (2) copper loss in the transformers at both ends of the line; (3) magnetic loss in the transformers located at both ends of the line. The ohmic loss in the line is directly proportional to the square of the current and to the resistance of the conductors. In long and very high-voltage lines the load current (1) may not always have an equal value along the line owing to the existence of capacity current (Ic). The ohmic loss is variable according to the change of load (power and power factor) and the temperature—the total energy is dependent on the power factor. In the design of a transmission line a value is usually assumed for the amount of energy annually transmitted, which value takes into account a load factor something after the style, "the maximum load is continuous for [*so many*] hours, the remaining [*so many*] hours being loaded about [*so many*] per cent. of the maximum." In actual practice the economical points upon which reasonings are based are rarely met, and where the most economical range of points has been adopted, the theoretical *true* minimum may be attained for but a very short period of the time, perhaps never; if, for instance, certain economic problems were not fully considered or not properly understood in the light of future changes in the character and amount of load, &c. Usually the load, diversity, &c., are assumed long before they actually exist, and, in consequence, certain discrepancies generally arise in practice.

When the distance of transmission is great, the cost due to the ohmic loss in the conductors and that due to the annual expense of line supports, conductors, and insulators, will tend to increase proportionally. Obviously the variation of load and power factor will have a great influence on the cost of transmission. When this latter factor is low, the efficiency will be proportionately low, and, as the total capacity is not being utilised efficiently, the annual expense will obviously increase in proportion. The cost of transmission is composed of an electrical cost (size, length, and spacing of conductors, the amount of load, the nature of the load, and the terminal apparatus, such as the efficiency of transformers, &c.), and a capital cost which represents the cost of line supports, conductors, insulators, transformers, land, buildings, switchgear, &c., and the interest, depreciation, maintenance, taxes, &c. The interest on the investment will depend on the value of the installation and the commercial conditions. The depreciation is usually carried forward from annual profits to provide for replacements. Maintenance, taken as a whole, will bear a definite proportion to the total amount of depreciation, hence the necessity of applying proper percentage values. The various items of depreciation and maintenance are not the same for the different parts of the complete undertaking. With regard to taxes, the usual taxes for a power transmission system are: (1) income tax; (2) land tax; (3) building tax. These taxes vary for different countries and for different localities in the same country. The cost due to annual expense will consist of several unequally durable and unequally costly items, the various items involved being wayleaves, line supports, conductors, insulators, transformers, lightning arresters, switchgear, land, buildings, &c. It can therefore be seen that the importance of one item is estimated not only by the amount of money invested, but by the coefficients of annual expense. Moreover the cost of the complete system is dependent not only on the first cost, but also on the coefficients representing the interest, depreciation, maintenance, &c., so that a low first cost for one part may very soon become a high-cost item when the maintenance expenses become excessive on account of short durability, *i.e.*, poor quality of materials, &c., and inferior engineering and workmanship. Thus, in the long "chain" of variables, we see many reasons that prove the accuracy of the above statements and the great need and importance of preparing reliable figures of every item, based on a sound engineering experience, so as to obtain as nearly as possible the best and the most economical design.

The modern tower line, carrying current at very high pressures, demands as careful study of its location as a railroad. In its proper location it demands a thorough knowledge of all the factors affecting the first cost, as well as subsequent operation; it requires a keen sense of observation, so that all the physical facts are accurately noted; that all advantages are taken and disadvantages avoided. In its location it is important to avoid, as far as possible, public highways, villages, telegraph and telephone lines, &c., at the same time keeping in mind such important points as the minimum distance of transmission, the minimum number of angles, the minimum altitude with minimum distance where corona is in evidence, and the safest protection from lightning. Sometimes tower lines are cheaper if located across rolling country (hills and valleys) where longer spans and fewer towers can be used than in flat country. A careful study of all these minimum points of cost, &c., will decide the best and the most economical transmission line *location*.

In the location of a line it is preferable to first run a preliminary line (on paper), then project the location. When the location line is being staked out, a careful classification of the ground crossed should be made showing rock outcrops, cultivated, bare, and/or swampy ground, &c. A line of fairly accurate levels should be run which will show breaks in ground of two or more feet. The field work should also show a record of all transverse slopes of more than about ten degrees. When the detailed profile has been completed, the line support locations can be made in the office. One such office procedure for properly locating line supports is to first make certain assumptions for loading—investigating sag and tension with a sudden drop in temperature or for a combination. A transmission line must be sufficiently high above the surface of the ground to conform with local and Government regulations, and the line support must be built to resist (*a*) the weight of the structure itself; (*b*) vertical load due to the lines; (*c*) windage on its own structure; (*d*) transverse load applied at the top. These will determine the size of members in tension or in compression of the support. The vertical load will be the total sum of the aggregate weight of conductors, insulators, sleet coating, &c., and the downward pull of conductors due to the difference in the height of the points of support. The weight of a steel tower is very much dependent on the tension of the conductors either in the deflection of line or in the unbalance of tension. The cost of structural steel and line support foundations will vary according to the commercial conditions. At the present time the type of steel towers generally used is the *rigid* type. The weight of the line insulators is dependent on the voltage. For very high voltages the predominating requirement is insulating capacity, so that transmission voltage principally defines the cost of insulators, although the cost is mainly dependent on their weight. Duplicate lines should, preferably, be constructed upon separate supports and over a different route to avoid the chance of interruptions from storms, &c. Against this advantage is the increased cost of line supports, wayleaves, patrolling, &c., but these may be offset by security of service. In the final staking out of line supports in the field it is most important to engage a first-class man. An inexperienced man may destroy part or all of the good work accomplished in the office by greatly increasing the cost of line supports (due to placing steel where it is not required), by endangering the line by mechanical weakness (due to placing ordinary supports instead of heavier supports at angles caused by changing the route to avoid obstacles not accounted for in the office location of the line), by causing an uplifting of the insulators sufficient to endanger or cause fracture of the cross-arms, by causing the clearance of conductors to extend below the allowable minimum, and, perhaps, finally causing a transmission line to be built that would, during the whole of its life, be an undue source of expense and danger.

For the transmission line itself, the *main* variables are voltage, power, and power factor; and, in view of the fact that a variation is dependent on the line constants and on the amount of and nature of load, it would seem that—considering all things—we are reasonably justified in basing the design on the *average* values of these said variables. Certainly at times there occurs in actual practice a wide range of the different values of these variables. Nevertheless, we may take it that, in general, the design—taken purely from the point of view of energy losses in transmission and the annual expenses of the line investment—may be limited to dealing with the averages of voltage, power and power factor.

As the cost of transmission would, in certain cases (perhaps generally), vary but little for different span lengths, a determination of the most economical transmission line would be to:—

(1) Decide on the most economical span for a definite voltage and definite size of conductor.

When this has been done, the next move would be to:—

(2) Determine the cost of the transmission line with the most economical span against the size of conductors for different values of transmission voltages.

Then:—

(3) Plot these values to show one curve for each transmission voltage.

Afterwards:—

(4) Mark off the minimum which determines *the most economical* size of conductors with *the most economical* span for a given voltage (standard voltages among others).

Then:—

(5) From the minimum points thus obtained for different voltages, draw a curve.

Finally:—

(6) The curve should show a minimum point for the most economical voltage of transmission, the most economical size of conductors, and the most economical spacing of line supports.

In conclusion, although the final choice will in any case fall between two different commercial *standard* voltages and two different commercial *standard* sizes of conductors*, both differing appreciably, one or the other of which must be selected for commercial and economic reasons, a point always to be borne in mind is that, in general, an ample design is comparatively less expensive than a curtailed one.

When either voltage or size of conductors is increased, the cost of transmitting energy will increase, due to the greater cost of the line, &c. The variation of the different parts of the cost with the change of voltage will be much more pronounced than that with the change of size of conductors. For a definite size of conductors the total cost of transmission will vary but little with a change of span, but it will vary greatly for a variation in the size of conductors; also, for a definite span, the annual expense will increase with increased size of conductors. The cost of line supports will increase with increased size of conductors, and the cost of insulators will increase with increased voltage. Among other points of equal importance not mentioned here, all the above aspects of the most economical transmission line design go to show, when properly balanced as regards the range in the values of the different *variables* and the difference between standard of voltage and standard of size of conductors, &c., that the mathematical or theoretical minimum need not be calculated to a high degree of accuracy.

ESTIMATING FOR INTERNAL WIRING CONTRACTS.

By ALAN KIRK, A.M.I.E.E.

The collation and analysis of estimates for the internal wiring of buildings for electric lighting during the past 12 months has been an interesting, although somewhat saddening, study.

In 95 per cent. of the cases reviewed there was a great discrepancy between the highest and lowest tenders, ranging from the order of 3 to 1 to the order of 6 to 1; even in the comparatively few cases in which plans and a full specification had been provided, the variation between the highest and lowest tenders was as 2 to 1. To enable one to appreciate the actual facts of the matter, it is necessary to carefully study the relative responsibilities of the parties concerned.

Assuming that the work to be executed has been placed in the care of a paid technical adviser, then the faithful preparation and carrying out of the contract becomes a joint liability shared by the adviser and the accepted contractor. The advisor should clearly specify the materials to be used, stating their quality and quantity, where they are to be fixed, and the method of fixing, and, finally, he should make sure that his instructions are properly carried out. The contractor tendering has to price the materials specified, including his estimated cost of erection in the manner and places detailed by the advisor and, finally, when accepted, he should execute the work with the materials specified in the manner and ways in all particulars as laid down in his instructions.

It can be accepted as an axiom that all tenders for internal wiring contracts are governed by two factors, *viz.*, (*a*) materials to be erected, and (*b*) labour for erection; also before (*b*) can be ascertained it is necessary to know the magnitude and disposition of (*a*); therefore, it is essential that the parties tendering must be in possession of the full facts concerning (*a*) in order to equitably estimate the requirements of (*b*).

Having established our ground-work, let us now examine in detail the methods employed in present-day practice for (1) obtaining tenders, and (2) estimating for contracts; then, with the information thus available, we can finally consider and set down the best means of improving the method of obtaining tenders and estimating for them.

Price per Point.—With this method the tenderer is asked to give a price per point for a certain system of wiring, and in the majority of cases the information regarding the disposition of the points in question is of the vaguest description. How can anyone give a fair tender on such a basis when both of the requisite factors are unknown quantities? That this is a most reprehensible method must be admitted by everyone who gives thought to the matter; in point of fact, tenders obtained on these lines resolve themselves into guessing competitions, and should be brought within the scope of the Lottery Act.

Plans with Points only Indicated.—Under this heading are grouped all schemes that rely upon the marking of plans with spots, crosses, &c., to indicate the proposed positions of wiring points as sufficient information for the tenderer to base his estimate upon, without any guidance as to the path the conductors are to follow.

That tenders obtained by this method should show a considerable diversity in the prices is not to be wondered at, if the multiplex paths the conductors can legitimately follow are taken into consideration. It is obvious that before the tenderers can price their estimates they must decide how and where they are going to carry the conductors. Should one of the tenderers decide to adopt a lay-out whereby the greatest economy in materials is obtained with a concurrent economy of labour, and another decide to select more divergent paths requiring a greater quantity of material and consequent increase of labour, the result might well be that the first being the lower tender is accepted, possibly to find later that the paths selected for the conductors are not acceptable to the advisor; whereas the lay-out embodied in the second tender more nearly represents the scheme in the mind of the advisor, but of which no indication had been previously given, and conceivably the true measure of the value of the work involved may be that of the higher tender.

It is pin pricks such as these that often cause a feeling of irritation between the parties concerned in the contract, which could so easily be eliminated by the adoption of more businesslike and up-to-date methods.

Plans with Lay-out Indicated.—Under this heading are included schemes for which plans are supplied by the advisor, showing the positions of all points, accessories, &c., and having the proposed paths that the conductors are to follow clearly indicated in such a manner that the tenderers reading them, in conjunction with the specification and schedules, can by measurement and calculation obtain the full facts concerning the magnitude and disposition of materials required for the due execution of the contract.

That tenders obtained by this method also show great divergencies in prices is undoubtedly due to the

* "Electric Power Systems" (London: Sir Isaac Pitman and Sons), by Wm. T. Taylor (page 6).

varying methods employed by the tenderers for measuring and calculating the quantities of materials required, which brings us to the consideration of (2)—namely, estimating for contracts.

Before proceeding with this consideration, it may be of interest to interpose a few extracts from specifications actually issued for the purpose of obtaining tenders:—

". . . the batteries are to be Leclanché dry cells fitted with nickel-plated gongs. . ."

". . . all v.i.r. cables and wires are to have an internal resistance of not less than 600 megohms. . ."

". . . the whole of the circuit wiring is to be arranged on the two-wire system suitable for 200 volts taken from the supply company's terminals at a pressure of 50 cycles per second. . ."

". . . all lamps and other current-consuming devices are to be grouped in such a manner that the periodicity on each phase of the supply is efficiently balanced when working under normal conditions. . ."

It is not suggested that the foregoing "errors of phraseology" are in accordance with the general trend of specifications issued, but merely examples of what the tenderer may meet with.

In considering the methods adopted for estimating the cost of executing internal wiring contracts it will be advantageous to classify them as follows:—

"*Bad*" methods of estimating embrace all those attempts which rely upon the "guessing ability" of the tenderer as their basis.

"*Fair*" methods may be taken as those which use as their basis a combination of definite information and averages obtained by technical experience.

"*Good*" methods are those which rely only upon definitely ascertained facts as their basis.

Average costs obtained from practical experience, if used for obtaining an approximate valuation of the work or as a check upon estimated values, serve a very useful purpose, but they should not be taken as a basis for an estimate. It is only by practical experience that a knowledge of the art of estimating the cost of labour can be gained, wherefore the attempted use of average costs by unskilled persons is liable to be disastrous. The method of estimating for internal wiring contracts generally used is the one designated as "Fair," the procedure being:—

After a perusal of the specification and plans has been made, certain circuits are selected as being those which will give, when averaged, the best representation of the average amount of materials required per point. The next step is to accurately measure up the quantities of material required for the selected circuits; having obtained this definite data, it is, by division and multiplication, converted into figures which are accepted as being the total quantities of material required for the contract, and, when priced together with the estimated cost of labour for fixing, form the net cost upon which the tender is based.

The procedure adopted for the method termed "Good" is similar in application to the foregoing, but instead of confining the measurement to certain circuits, the quantity of material required is obtained by measurement of the entirety.

The weakness of the "Fair" method lies in the human element involved, *i.e.*, the skill required to select representative circuits of true value. For the purpose of obtaining data upon this matter a considerable number of tests were made on various wiring plans by taking a definite number of circuits in varying positions, such as the longest and shortest runs, all medium runs, &c., and the results disclosed discrepancies ranging from 7 to 20 per cent. between the average quantities so obtained. In no case did the average quantities accurately represent the actual quantities required.

Some of the reasons why the "Good" method is not generally adopted are: Insufficient information, lack of time, inability of the person estimating, and satisfaction with average accuracy.

The remedy for nearly all the evils outlined is the adoption of "bills of quantities" for tenderers to price; by this method definite quantities of specified materials are given and, in conjunction with the necessary plans and specification, the tenderers have full and complete information regarding the magnitude and disposition of the materials required, and are thus in a position to accurately estimate the labour costs of erection.

It does not seem unreasonable to advocate a method whereby the quantity of material requisite and necessary for the due completion of the work shall be compiled and tabulated for the use of the firms invited to tender for such work, in lieu of the existing methods which necessitate the taking off of quantities by each individual tenderer. Electrical bills of quantities provide a complete schedule of rates usable for variations, and such rates are absolutely proportional to the estimated amount of the tender.

In conclusion, it may be claimed that sufficient evidence has been adduced to warrant the general adoption of Electrical Bills of Quantities for obtaining tenders for internal wiring contracts. There is no difficulty to be faced in the matter if the work be placed in the hands of a competent electrical quantity surveyor, the procedure being analogous to the well-tried method in vogue for nearly all building contracts, for which bills of quantities are prepared by a quantity surveyor and incorporated with the plans and specification for tendering purposes. It is confidently anticipated that if the method advocated was adopted generally the beneficial effects resulting therefrom would be felt throughout the electrical profession and industry.

THE LOADING OF A CURRENT TRANSFORMER.

(Communicated.)

Current transformers have two distinct ratings, the first specifying the primary current required to produce five amperes in the secondary circuit, the other rating giving the maximum loading of the secondary side in volt-amperes. The current rating of a transformer is fixed, more or less, on a basis of temperature rise; and the primary current required to give five amperes secondary current is the maximum normal current the primary winding will be called upon to carry. The volt-ampere loading of the transformer is, on the other hand, fixed on an accuracy of transformation basis, and specifies the maximum load that can be drawn from the secondary winding without definite limits of error being exceeded. The two standard ratings for current transformers are 15 and 40 volt-amperes.

Let us consider the case of a 15-volt-ampere transformer. Since the maximum secondary current is 5 amperes, the voltage on the secondary terminals when this current is flowing will be 3, and the impedance of the external secondary current 0.6 ohm. If now the primary current be reduced, the secondary impedance remaining the same, both the secondary current and the secondary voltage will diminish approximately proportionally to the primary current, and the volt-ampere output of the secondary will vary with the square of the primary current. With one-tenth of the full-load primary current, for instance, the volt-ampere output will be 0.15.

The errors of current transformers are due to the fact that a component of the primary current is used to magnetise the core to a degree sufficient to generate the required secondary voltage, and the whole of the primary current is not therefore available for transformation. The actual secondary current is therefore less than that calculated from the turns ratio, and, moreover, there is a phase angle between this current vector and that of the primary reversed. The

magnitude of the errors clearly depends upon the magnitude of the primary magnetising component. For a secondary voltage of 3, the primary magnetising component depends upon the number of turns in the primary and upon the dimensions of the magnetic circuit and upon the characteristics of the iron. If the primary current be halved, the secondary voltage and the flux in the core will also be halved. If the magnetising current necessary to produce this flux were also halved, the proportion that this component bore to the total current would be the same, and the error of the transformer would be unaltered. Unfortunately, at the low densities used with current transformers, the relationship between flux density and magnetising force is not one of proportionality, the B H curve being in shape more like a parabola with a vertical axis. As the density diminishes, the magnetising current is greater than it would be if there were proportionality between these quantities. Accordingly, at low primary currents a relatively larger component is required to magnetise the core, and it is found that, with a constant secondary impedance, the errors increase as the primary current diminishes. In other words, as the primary current decreases, the secondary current becomes relatively less, and the phase displacement becomes greater.

The volt-ampere rating of a transformer, therefore, really fixes the value of the secondary impedance, which cannot be exceeded if the errors are to be kept within assigned limits. The volt-ampere loading refers to the output when the transformer is supplying 5 amperes, and at other currents the permissible loading varies as the square of the secondary current. The wording of the B.E.S.A. specification for instrument transformers is a little obscure on this point, as from a casual reading it might appear that a transformer is required to supply its rated volt-ampere output at any secondary current down to 0.5 amp. without the limits of inaccuracy being exceeded. If this were the requirement, the maximum secondary voltage for a 15 volt-ampere transformer would be 30. The flux would therefore be 100 times that required with a load of 0.6 ohm impedance.

In view of the fact that a 5-ampere full-load secondary current is now invariable, it would seem more reasonable to rate a current transformer on an accuracy basis by the maximum impedance of the secondary load it can supply. The two values of the impedance corresponding to the standard ratings of 15 and 40-volt-amperes are 0.6 and 1.6 ohms respectively.

In conclusion, it may be noted that the B.E.S.A. specification gives the limits of error with a non-inductive secondary load. The effect of an inductive load on a current transformer secondary is to diminish both the phase angle and the secondary current as compared with a non-inductive load of equal impedance. Since, in actual practice, the load of a current transformer is rarely non-inductive, it would seem preferable to specify the limits of error applying to a load of the character of those representing average conditions.

THE RAMSAY TURBO-ELECTRIC LOCOMOTIVE.

THE Ramsay condensing turbine-electric locomotive, illustrated in fig. 1, may be regarded as the second practical attempt made in this country to introduce the condensing turbine locomotive with electric transmission, the first one being the Reid-Ramsay locomotive built by the North British Locomotive Co., Ltd., Glasgow, and tried on the Cowlairs Incline, Glasgow, in the year 1910.

In locomotives of this type the principal, and indeed, the primary object, is to economise in fuel and water, and a super-heater boiler with, in this case, a total heating surface of 1,453 sq. ft. is provided for generating steam for actuating the main and auxiliary turbines. A condenser of novel design is installed into which the exhaust steam from the turbine is discharged through a large-diameter pipe, being expanded down from boiler pressure to a vacuum of 27½ in., the condensate being drawn off from the condenser by a rotary extracting pump and returned to the well, from which a feed pump delivers the water into the boiler, thus completing the cycle.

The Ramsay locomotive is, in effect, two separate units which, when coupled together, to a large extent resemble a locomotive with its tender as in ordinary practice. As a matter of fact, however, both units form separate engines coupled together. The front one, both as regards the boiler and framing, differs but little from accepted locomotive practice, with the exception, of course, that the features of the cylinders, reciprocating parts, &c., are replaced by a turbo-generator, this being supplied by the Oerlikon Co., of Zurich. The main turbine is of the impulse pressure compounded multi-stage type, connected through a flexible coupling to a three-phase generator capable of sustaining a 25 per cent. overload for half an hour. This generator is separately excited by an auxiliary turbine-driven direct current generator. The three-phase generator supplies power to four three-phase slip-ring motors arranged in two groups on the front and rear parts of the locomotive respectively. The two motors of each group are bolted to a common stretcher carrying a countershaft to which the motors are geared. The power is then transmitted from the countershaft to the six driving wheels on each engine unit by coupling rods in the ordinary manner. Each of the motors is capable of developing 275 h.p.

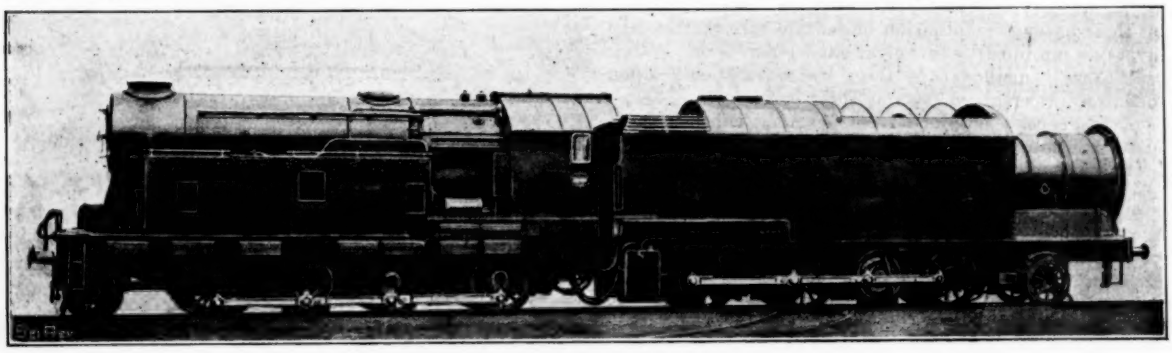


FIG. 1.—THE RAMSAY TURBO-ELECTRIC LOCOMOTIVE.

The rear engine incorporates the coal bunker and cooling water tank, as well as the condenser and its appurtenances. The condenser is of the evaporating type supplied with air by a fan at the rear of the engine. The steam tubes of the condenser are arranged in the form of a cage, which is caused to revolve in water at slow speed, and through which air is impelled by the fan in a radial direction over the tubes. A flexible pipe between the two portions of the engine connects the turbine exhaust to the condenser.

The boiler is hand fired and fitted for forced draught. The driver manipulates the locomotive by means of a master controller placed in the cab.

The leading particulars are as follows: Length over-all, 69 ft. 7 in.; length, wheel-base, 59 ft. 4 in.; total weight, including 2,200 gallons of water for cooling purposes and 4 tons of coal, 130 tons 15 cwt.; adhesive weight, 108.5 tons; tractive force, 22,000 lb.; turbo-generator, 890 kW at 3,600 revs. and 27½ in. vacuum, voltage 600.

The locomotive was constructed by Sir W. G. Armstrong, Whitworth & Co., Ltd., at the firm's Scotswood works, to the design of the Ramsay Condensing Locomotive Co., Ltd.

We are indebted to our contemporary *The Railway Engineer* for the above information and the illustration of the locomotive.

International Trade Conference at Venice.—The General Council of the International Parliamentary Trade Conference will meet in the Doge's Palace at Venice on October 3rd.—*Reuter* (Brussels).

INSULATING MATERIALS.

Developments in Great Britain.

A paper that was presented at the June Convention of the American Institute of Electrical Engineers, at which the author attended as a delegate from Europe of the International Electrotechnical Commission, is intended to show the lines along which the manufacturers of electrical apparatus in Great Britain are dealing with their insulation problems. The facilities that have been established for insulation research are outlined and the more important developments in insulating materials and processes employed in the various classes of electrical apparatus are discussed, with special reference to thermal characteristics and consideration. The opinions of British electrical engineers upon certain aspects of temperature rating of machinery as effected by insulation are considered by the author, who suggests a bold advance in two main directions: first, the use of higher temperature limits where experience indicates that this can be safely done; and, secondly, the comparison of machine performance on a basis of temperature rise rather than on that of total temperature recommended by the International Electrotechnical Commission.

In the course of his paper, which we abstract from the *Metropolitan-Vickers Gazette*, Mr. A. P. M. Fleming, M.I.E.E., &c. (Metropolitan-Vickers Electrical Co., Ltd.) points out, *inter alia*, that most research work has been directed principally to extending knowledge of the behaviour of insulation, improving quality, developing more scientific insulating processes, defining the requirements of insulation users, and standardising the methods of testing materials. A most important development has been the increasing tendency in recent years for makers and users of insulation to co-operate either individually or through the medium of the British Electrical and Allied Industries Research Association.

Industrial Machines.—For machines other than traction, crane and mill motors, Class A materials are employed, *i.e.*, organic insulation of cotton, silk and paper, either impregnated or untreated. In addition mica wrappings or linings of similar material are employed to a very considerable extent on the slot portions of windings.

No very great advance in quality can be looked for in Class A materials. Certain improvements that are worthy of some note, however, are briefly as follows* :—

Pressboard is a fibrous insulating material otherwise known as fullerboard, presspahn, &c., which before the war was made only to a very limited extent in England, the supplies being obtained from America or the Continent. While materials similar to those originally imported are now manufactured in England to meet the requirements of certain markets, newer types of pressboard have been developed along two distinct lines, having the following characteristics :—

(1) A soft, porous, sheet material made from a mixture of fibres, and rendered as absorbent as possible. This material is principally used for transformers, but is also applicable to machine insulation. Its great absorbent property is secured at the expense of a comparatively low density and correspondingly decreased di-electric strength.

(2) A dense non-absorbent sheet material, of which the fibres are reduced to a semi-colloidal state, resulting in a product which is very hard and dense, possessing exceptionally high di-electric strength and capable of withstanding prolonged immersion in hot oil without loss of mechanical properties. It has been prepared from a mixture of fires containing a large percentage of jute. Owing to its ligno-cellulose character, however, jute has the characteristic property of becoming somewhat brittle at temperatures higher than about 100 deg. C. and, therefore, if required to meet more severe temperature conditions than this, it will probably be necessary at some manufacturing inconvenience to employ a cotton base to secure improved ageing properties.

The following table indicates the principal characteristics of these two types of materials, together with those of pressboard of ordinary quality, the test for comparative purposes having been made on 1/32 in. thickness of sheet :—

Quality.	Density	Breakdown voltage per mil in air after 1 minute's application.	Per cent. of water absorption after 24 hours.	Tensile str. in tons/sq. in.		Minimum radius bend without fracture after 24 hours in hot oil at 105° C.
				With grain.	Across grain.	
Soft absorbent ...	1.10	250	110	2·80	3·50	Folds flat.
Dense non-absorbent	1·43	518	44	5·20	3·80	⅛"
Ordinary grade ...	1·25	300	110	4·60	3·60	¼"

Varnished Cloth.—Considerable progress has been made in the manufacture and in investigating the behaviour of this material under working conditions, particularly the well-known phenomenon of the very excessive reduction of the di-electric strength with increase in temperature, which is more marked in varnished cloth than in other Class A materials. Particular attention has been paid to the specially important point of dressing. Many large manufacturers claim that a dressing is essential to prevent varnish coming into close contact with the cotton fibres, as it is considered that such contact deteriorates the cloth. Another important consideration is the suitability of the varnishes used, *viz.*, the resin content and the contents of driers. If the resin content is too high the cloth lacks flexibility; if too low, the varnish film lacks sufficient strength. The contents of driers is of supreme importance. For a varnish film to possess a high di-electric strength the varnish must be oxidised as completely as possible. Too low a content of driers causes poor di-electric strength. There is, however, an upper limit of drier content and if this is overstepped in the slightest degree bad "tendering" of the fabric results, which frequently does not reveal itself until several months after manufacture, and it can take place in a batched and wax-protected roll in the absence of air. It is thought that in the presence of excess driers unstable oxides are formed in the varnish film, and that these gradually decompose with the liberation of free oxygen, which causes the "tendering." In all cases where "tendering" results the di-electric strength of the varnish cloth is found to be exceptionally good. No knowledge has yet been gained as to the effect of such unstable oxides on the varnish film under actual working conditions, but it is quite possible that at a temperature of 100 deg. C. their decomposition would be accelerated, and that the film might be further oxidised either with the formation of an acid sticky mass, or possibly of a friable power. In any case there would be considerable mechanical weakening of the cloth which, coupled with the effects of vibration, might bring about a breakdown.

Synthetic Varnish Paper Boards and Tubes.—The general tendency is to curtail their use until their properties, particularly as regards absorption of moisture and low surface resistance, are more thoroughly understood. A great deal of investigation in this direction is in progress.

Moisture-proof Treatment of Windings.—In none of the materials employed in these processes has there been any marked improvement in recent years. While it is generally felt that Class A materials have nearly reached their physical limits of durability under the temperatures and conditions met with in practice, there is still much knowledge to be obtained which will correlate the results obtained in the laboratory with those of practical experience in service.

Turbo-Alternators and other Large Machines.—The tendency has been to employ materials of Class B. Some manufacturers do this to a limited extent in the case of stator windings, where the materials usually consist of combinations of mica with paper or cambric. The volume of mica ordinarily contained in a commercial grade of these materials may be as low as 25 per cent.; this proportion does not compare favourably with that of the insulation practicable on turbo-rotors. Mica paper tape and mica silk enable the application of a higher percentage of mica to be made.

No effective fire-proof treatment of stator insulation has yet been found. Turbo-rotor windings can be insulated almost entirely with hard-pressed micanite containing not less than 90 per cent. by volume of mica. The small quantity of Grade A insulation that has to be employed during the assembling of these windings can be disregarded. Further, in supporting the ends of the windings, an almost non-inflammable insulation, such as that prepared from asbestos and synthetic resin, can be used, thus rendering the whole of the insulation of the rotor extremely heat-resisting. Probably the most marked improvements in the insulation of this group of electrical machinery are secured through the closer technical control and supervision that is now exercised of insulation processes in the shops, and the more rigid selection of the insulation materials employed.

Transformers.—Materials of Class A are used extensively. There is a tendency now to employ pressboard of the very dense quality, which is very strong both di-electrically and mechanically at the highest temperatures met with in practice. Tests on a cylinder of this material after exposure to a temperature of 80 deg. C. for twenty hours and then to oil at a temperature of 90 deg. C. for two hours, yielded the following breakdown figures :—

Instantaneous breakdown	... ...	550 V per mil
Breakdown after 1 minute	... ...	445 V per mil
Breakdown after 5 minutes	... ...	400 V per mil

These results give a time voltage curve at this temperature of a very favourable character.

The correlation between laboratory tests on highly refined non-sludging oils and their behaviour in practice is not as yet very complete. It is possible that their use affords an unnecessary margin of safety in the case of certain types of transformers, and that somewhat cheaper oils would be satisfactory in transformers where there is a minimum amount

* See Elec. Rev., August 18th, 1922; p. 227.

of bare copper exposed to the catalytic action, and where there is a minimum amount of oil surface exposed to the air.

Laboratory Tests and Service Experience.—While it is indisputable that the rating of electrical machinery must be based upon the temperature which insulation will withstand, it is becoming appreciated that only upon the results of practical experience with the operation of machines under known service conditions and for long periods can conclusions as to the durability of insulation satisfactorily be drawn. There has been a tendency to attach too great importance to laboratory investigations. The increasing tendency for power plant engineers to maintain careful records of temperature performances of their large generator and transformer units will eventually afford data of the utmost value and serve to confirm or amend present ideas as to correct temperature ratings.

Temperature Considerations.—The temperature limits now proposed for Class B materials, under the new methods of measurement, whilst apparently higher than the figures formerly recognised, do not actually imply higher internal temperatures than have existed in the past, or than the results of experience indicate as safe. In those cases where conditions permit the use of materials which withstand high temperatures, all features of design should be viewed in proper perspective, and full advantage taken of high temperature limits, if by doing so better all-round performance results.

In connection with the tendency on the part of British manufacturers to employ in transformers highly refined non-sludging oils, coupled with the use of dense fibrous materials which will withstand high temperatures without deformation or serious loss of insulating value, it is felt by some that the employment of oil conservators safely permits higher temperature limits both in the oil and windings than are permissible without the use of these devices.

Ratings based upon Temperature Rise.—In the case of industrial machines there is a strongly growing opinion among British engineers that in the rating of electrical machinery the decision of the International Electrotechnical Commission to establish a basis for comparing tenders by different countries, according to total temperature, was a mistaken policy, and that temperature rise affords a much more satisfactory means of securing this object. The combinations of insulation used, particularly on turbo-alternators and other large machines, differ considerably in the proportions of organic and inorganic materials that they contain and consequently also in their heat-resisting properties. It is felt that the present classification is unsatisfactory and should be revised, some differentiation being made in the limits set according to the quality and the position in which any particular type of material is used. For instance, the insulation that is possible for rotor windings throughout may be relatively of superior heat-resisting quality to that which is sometimes used on the slot portions of stator windings, which again is, in general, superior in this respect to the insulation on stator end windings.

A NEW TELEGRAPH SYSTEM.

Uninfluenced by Traction Currents.

At the recent 9th Congress of the International Railway Association at Rome a report was submitted regarding a new telegraph system for one-wire circuits with earth return which is claimed to be insensible to perturbation currents produced by induction from electric railways working on the a.c. system. This contribution to the solution of an old problem forms the subject of patents No. 139,241 (Great Britain), and No. 1,395,953 (U.S.A.), and has been utilised by the Administration of the Italian State Railways on the Turin-Torre Pellice-Berge three-phase, 16.7-cycle, 3,600-volt railway line where it has made it possible to retain unaltered, the one-wire external circuits even where they are mounted on posts placed on the railway track.

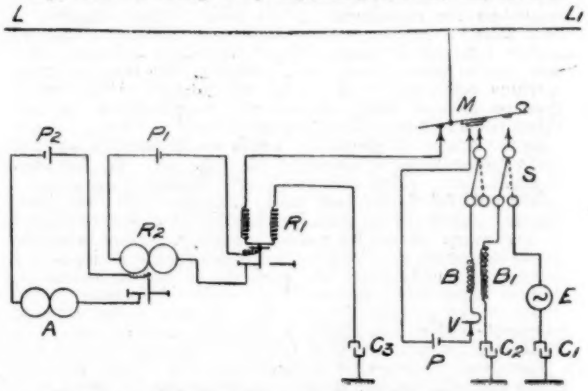
The system, which was devised by Messrs. Frattola, Castelli and Regnoni, officers of the said Administration in Rome, is based on the well-known principle of electric resonance. A Commission formed of officers of the Administration of the State Railways and the Ministry of Posts and Telegraphs has examined the installation and has ascertained, with satisfaction, its regular and practical working. The system is to be applied on some telegraph circuits of the Genoa-Spezia line, on which traction with three-phase current is shortly to be introduced; its application has also been decided upon for circuits on the Rome-Formia branch of the new Rome-Naples line, which is also to be electrified with three-phase current; other installations have been taken up for study.

For transmission an alternating current of a relatively high frequency as compared with that of the perturbation currents is used, while for receiving purposes a device is employed which is in electric resonance with the frequency of the transmission current, so as to be able to work regularly only with the latter current and to be insensible to the perturbation currents. Such a device may consist, in its simplest form, of an inductance and a capacity in series.

In practice the transmission current may be obtained in various ways; for example, from an alternator controlled by a small electric motor which is fed by accumulators or by the local network for the distribution of electricity, or from an ordinary induction coil of the vibrator type. Where industrial current, for instance of from 42 to 50 periods, is available, it may be used directly after a duplication or triplication of the frequency by means of static transformers of the saturated-iron type, such as the Vallauri doubler and the Spinelli triplicator.

In the installation in question this latter apparatus has been adopted, by means of which the three-phase current of 42 and 50 periods is transformed into one-phase current of 126 and 150 periods; as a reserve generator each telegraph station has an induction coil with a spring vibrator fed by a battery of from two to four accumulators.

For receiving purposes the scheme shown diagrammatically in fig. 1 has been chosen, in which M is an ordinary Morse key with five clamps. By depressing this key the receiving



L L_1, line; M, double Morse key; S, two-lever switch; B B_1, induction coil; V, vibrator; P, P_1, P_2, accumulators; C_1, C_2, C_3, condensers; E, Spinelli transformer; R_1, polarised relay; R_2, ordinary relay; A, Morse apparatus.

Fig. 1.—Receiver Circuit Diagram.

device is separated from the line and alternating current is sent to it by a Spinelli triplicator E or by an auxiliary induction coil B B_1. When the key is at rest the transmitting device is insulated from the line, which instead communicates with the receiving device, which consists of a polarised relay R_1 whose armature vibrates so as to render intermittent a contact which closes the circuit of the cell P_1. This increases its resistance and thus diminishes the current supplied by the cell P_1. The relay R_2 now sets free its armature, which will then close a second circuit, which comprises the writer A. The receiving apparatus may be simplified by using the polarised relay as a sounder.

The "General Direction" of the Italian State Railways caused a series of experiments to be made with the above apparatus in order to ascertain its efficiency on the Torino-Pinerolo line (the first electrified track of the Torina-Torre Pellice-Berge line) on which the telegraphic circuits were exposed to inductive electromotive forces of considerable duration and higher than 100 volts and with maximum points up to 258 volts. With these strong induced voltages the apparatus assured clear and undisturbed communication, while with ordinary apparatus inserted in the same one-wire circuit an uninterrupted trembling of the armature of the writing device occurred, which rendered transmission quite impossible.

The conclusions arrived at after these experiments may be summed up as follows: (1) the system allows regular working of ordinary Morse apparatus on one-wire circuits exposed to perturbations; (2) the attenuation which the use of alternating currents inevitably implies as regards the distance of the transmission can practically have no importance within the limits of the ordinary lengths of circuits for railway service; (3) the perturbations produced in turn by the alternating-current telegraph system on the neighbouring and parallel telegraphic circuits have no influence on the working of the Morse apparatus; (4) the perturbations produced on neighbouring and parallel double-wire, telephone lines are, in the cases observed, of the same order as those produced by other telegraphic circuits when a generator of the coil type is employed; they are quite insensible when a current generator with a smooth wave is employed. The system might also be applied to telegraphic circuits worked by the aid of high-speed apparatus, such as the Hughes apparatus, by employing suitable transmission frequencies.

The installation on the Torino-Torre Pellice-Barge line comprises 35 telegraphic groups, with as many a.c. receiving apparatus, divided between 16 stations. The apparatus was constructed by the Società Anonima Arco, of Rome, and the Spinelli triplicators by the Società Officine per costruzioni elettriche già Biascà, of Milan. The latter have a power of 100 watts and three tappings on the secondary for voltages of 70, 110 and 150 volts. In all the circuits a pressure of 110 V is used, and at the stations of Piscina, Bibiana and Campiglione, where electric energy is not available, the induction coil is used for transmission; in the stations

between Turin and Airasca the Spinelli triplicator is fed with three-phase current at 50 periods, and generates single-phase current at 150 periods; beyond Airasca the Spinelli apparatus is fed with three-phase currents at 42 periods and generates monophase current at 126 periods. In this way different circuits are working, without its being necessary to regulate the apparatus, with two transmission frequencies and sometimes even with three frequencies; when in some stations the current supplied by the Spinelli transformers fails, the service is carried on with the reserve induction coil.

No modification is made in the external circuits formed with an ordinary wire of galvanised iron of 4 mm. diameter; the installation was put into use in November, 1921, and from this period onward it has continued to work in a satisfactory way. Also during periods of heavy snowfall, with contacts and breakages of the wires, the telegraphic service was not interrupted. As the telegraphic groups are connected in shunt on the wires of the line, each interrupted branch formed a circuit for itself, and two or more circuits with the wires in contact formed one single circuit.

THE ELECTRICITY (SUPPLY) ACT, 1922.

THE following is a summary of the principal clauses of the Act, which became law on August 4th :—

Section 1.—*Power of authorities to borrow.*—Subject to the consent of the Electricity Commissioners, a joint electricity authority may borrow money for the purchase of any generating station or main transmission line, or of any undertaking, transferred under the Act of 1919, or for the purpose of any work the cost of which is spread over a term of years (including the payment of interest on borrowed capital, up to five years), or for working capital. Such moneys may be charged on the undertaking and revenues of the authority, and must be repaid within 60 years. A limit is to be set on the borrowing power of the authority by the scheme constituting such authority.

Section 2.—*Sinking fund for new works.*—The sinking fund may be suspended for not more than five years.

Section 3.—*Power to authorise issue of stock.*—The Electricity Commissioners may authorise an authority to issue stock charged on the undertaking and revenues of the authority.

Section 4.—*Power to discharge purchase price by issue of stock.*—An authority may discharge part or the whole of the purchase price, with the consent of the authorised undertakers concerned, by the issue of stock to the latter.

Section 5.—*Power of undertakers to give financial assistance.*—Any authorised undertakers whose area of supply is wholly or partly within the district of a joint electricity authority, any local authority, company or person supplied with electricity by the authority, and the Council of any municipality having a population of 50,000 or more, wholly or partly within the district, may lend money to the authority, subscribe for securities, or guarantee the payment of interest on loans, subject in the case of municipal bodies to the consent of the Minister of Health, and to prescribed limits to the liability undertaken. For the above purpose local authorities may raise loans in accordance with the relevant statutes, and any company or association may use its funds or raise loans, notwithstanding anything contained in its constitution. A scheme constituting a joint electricity authority or other body may authorise or require authorised undertakers, or authorise companies and other bodies represented on the authority, to contribute towards the administrative expenses of the authority. Any authorised undertakers may exercise such powers notwithstanding the provisions of the Electric Lighting (Clauses) Act, 1899, incorporated in their orders or special Acts.

Section 6.—*Power of authorised undertakers to lease undertaking to joint electricity authority.*—Any authorised undertakers may lease to a joint electricity authority the whole or any part of their undertaking, subject to the approval of the Electricity Commissioners, on terms agreed upon between the parties.

Section 7.—*Expenses of Electricity Commissioners.*—The period of two years mentioned in section 29 of the Act of 1919 is extended to March 31st, 1922, and advances made to the Commissioners must be repaid with interest before March 31st, 1925. The Electricity Commissioners may, during the financial year now current, apportion the excess of expenses over receipts among the joint electricity authorities and authorised undertakers of Great Britain in accordance with the units generated or purchased by each in 1921; subsequent apportionments must be made on the basis of the number of units actually sold by each authority or undertaker, less those sold in bulk to authorised undertakers. Returns must be furnished to the Commissioners by March 1st in each year.

Section 8.—*Method of payment of purchase price payable to local authorities.*—Payment to a local authority for transfer may be made by terminable annuities, a capital sum, or other form of payment approved by the Commissioners.

Section 9.—*Use of main transmission lines by agreement.*—A joint electricity authority may use transmission lines on terms agreed upon by the owners.

Section 10.—*Disposal of stations and works not required.*—A joint electricity authority may dispose of surplus plant, &c., subject to the safeguarding of existing rights of ownership.

Section 11.—*Power to continue wayleaves.*—Wayleaves for electric lines may be continued after the termination of existing agreements unless the owner or occupier of land involved objects, in which case the provisions of the Act of 1919 must be complied with; the joint electricity authority or authorised undertakers using such a line may at any time apply to the Minister of Transport for a revision of the terms of the agreement, in which event the case shall be treated as that of a new line.

Section 12.—*Power to make agreements as to working of generating stations.*—Where a station or line is transferred to a joint electricity authority, the authority may agree with the former owner that he shall work and maintain it on behalf of the authority.

Section 13.—*Conditions under which restriction on generating stations and obligation to take supply from are not to apply.*—The Electricity Commissioners are not to refuse consent to the establishment of a new, or the extension of an existing, generating station by an authorised undertaker, nor shall they require authorised undertakers to take a supply of electricity from a specified source if the undertakers can give an adequate supply to meet present and prospective demands at a cost not greater than would result if they obtained a supply from a source designated by the Electricity Commissioners unless the Commissioners determine that such refusal or requirement is necessary in the interest of the general supply of electricity in the district.

Section 14.—*Suspension of powers of purchase of undertakings.*—The Commissioners, with the consent of the authorities in whom the powers are vested, may by an order establishing a joint electricity authority or a special order suspend powers relating to the purchase of any undertaking or part thereof; in such a case they may make provision as to the relation between the prices which may be charged for electricity and the dividends to be paid by the undertakers.

Section 15.—*Mode of exercise of powers by authorities.*—The powers and duties as to the generation and supply of electricity conferred upon joint electricity authorities may be exercised by the authorities or, if so authorised by the order establishing that authority or by special order, through any authorised undertakers.

Section 16.—*Limitation on powers of joint electricity authorities in areas of power companies.*—A joint electricity authority is not to supply electricity in any part of the area of supply of a power company without the consent of the company, unless the latter is not willing and able to supply electricity under contract ensuring an adequate return, in which case the Electricity Commissioners may authorise a joint electricity authority to supply in the part of the company's area concerned, without the consent of the company, by special order.

Section 17.—*Special provisions as to power companies.*—On or after establishing a joint electricity authority, the Electricity Commissioners may exclude from the area of supply of any power company, any part of that area in which any right of the company to supply electricity is subject to the absolute veto of some other authorised undertaker, and where the generating station supplying that part is transferred to the joint electricity authority, any part which at the time of the local inquiry is not being supplied by the power company; and with the consent of the power company, any other part of the company's area; and in any such case they may empower the company to supply electricity for all purposes in any other part of its area not forming part of the area of supply of any authorised distributors. If objection is taken, the procedure is to be by a Special Order under section 26 of the Act of 1919. The rights of the power company to lay mains through such excluded areas, and to supply electricity for traction, are preserved.

Section 18.—*Limitations on prices charged.*—The prices charged for electricity by a joint electricity authority are to be such that, over a term of years, the receipts shall cover the expenditure, with such margin as the Electricity Commissioners allow. A deficit, unless provided for out of a reserve fund, may be apportioned amongst the authorised undertakers who take a supply of electricity from the authority in proportion to the amount supplied to each, or may be made good out of the revenue of succeeding years.

Section 19.—*Amendment of section 5 of the Act of* 1919.

Section 20.—*Amendment of section 6 of the Act of* 1919.—The representation on a joint electricity authority of persons employed in connection with the supply of electricity within

the electricity district is made permissible, and the provisions of the scheme may include determination of the conditions of employment of persons employed by the authority.

Section 21.—*Amendment of section 16 of the Act of 1919.*—The provision for compensation of employés displaced is extended to include consequential circumstances, the Electricity Commissioners to decide whether the circumstances are consequential. The Minister of Labour may make rules as to the procedure before the referees, for limiting the amount of costs, for fixing the fees payable to the referees, and for determining by whom they shall be paid.

Section 22.—*Methods of charging and revision of prices.*—The method of charging prescribed by the Electric Lighting (Clauses) Act, 1899, is repealed. The ordinary period of revision of maximum prices is made three years, and the provisions as to revision are extended to local authorities and to undertakers not otherwise included. The benefit derived by undertakers from the establishment of a joint electricity authority is to be taken into account in revising the charges. Undertakers who have already obtained an Order varying the charges may apply for revision though the period of three years has not expired. Section 10 of the Electric Lighting Act, 1909, is repealed.

Section 23.—*Stand-by supplies of electricity.*—Persons requiring a stand-by supply must pay the undertakers such minimum annual sum as represents a reasonable return on the capital expenditure and will cover other standing charges incurred in providing for the possible maximum demand, the amount to be determined in default of agreement by arbitration. Section 15 of the Electric Lighting Act, 1909, is repealed.

Section 24.—*Provision as to railways.*—Electricity supplied by a joint electricity authority or power company for traction or docks and harbours may be used by the recipient on any part of his system.

Section 25.—*Power of persons not being undertakers to supply electricity.*—Persons generating electricity for traction under statutory powers may supply electricity to a joint electricity authority, an authorised undertaker, or any consumer (subject to the consent of an authorised undertaker entitled to supply such consumer) provided that the consent of the Electricity Commissioners is obtained, who may impose conditions, and that supply shall not be given to authorised distributors within the area of a power company without the consent of that company, or to any premises within the district of a joint electricity authority but not within the area of any other authorised undertakers without the consent of that authority, and provided also that the rights of the owners or lessees of traction power stations are not interfered with. The Electricity Commissioners may authorise the breaking-up of roads, railways and tramways where necessary for the purpose of such a supply. The rights of the Postmaster-General under existing Acts are to be preserved.

Section 26.—*Provision for payment-off of debentures in certain cases.*—Where the generating station of a company is acquired by a joint electricity authority, provision is made for the payment-off of debentures charged upon it out of the proceeds of the sale; the cost incurred in obtaining and carrying out the scheme for payment to be borne by the authority.

Section 27.—*Winding-up of companies.*—After the whole undertaking of any company incorporated by Act of Parliament is transferred to a joint electricity authority, the company may be wound up as though registered under the Companies Acts.

Section 28.—*Expenses of London County Council.*

Section 29.—*Extension of period for repayment of money borrowed by Scottish local authorities.*—A period not exceeding 60 years to be substituted for 30 years for repayment of money borrowed after the passing of this Act, for electricity supply.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Spark Tester and Fuse-Wire Case.

The Humphrey Electrical Co., 24, Broad Quay, Bristol, has sent us samples of two useful devices. The first is a little appliance for cleaning and testing sparking plugs. It is in the form of a vulcanite pencil with a sliding interior. When the inner portion is moved two wires project and one of these is applied to the plug while the other is earthed. By the same movement a brush projects from the other end.

The second device is a small folding leather case in which are contained two coils of fuse wire—very convenient things to possess. The firm is supplying these with gold-blocked lettering as advertising media.

The "Baker" Lamp Shade.

A simple and inexpensive, but at the same time artistic, lamp shade, has recently been placed on the market by Messrs. Stanley H. Baker, Ltd., 5, Back Balloon Street, Manchester. It is made in two forms, circular and pentagonal, and consists of a shaped, flat piece of special parchment, bearing effective designs, which can be bent to take up its shape and fixed by means of tabs. It is fitted on to

Fig. 1.—The "Baker" Lamp Shade.

a circular or pentagonal piece of cardboard which is placed over the lampholder. The material is treated to render it fireproof, and the colouring is such as to serve for a very long period without fading or changing. A typical design is illustrated in fig. 1.

The "Electrico" Photographic Plate Drier.

Electrico, Ltd., 105, Old Christchurch Road, Bournemouth, has recently placed on the market a cabinet for drying photographic plates and films (fig. 2). This is a rectangular box with a folding stand for eight plates. The box is mounted

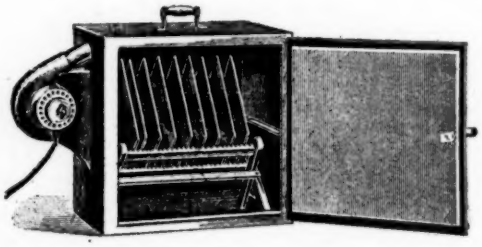


Fig. 2.—The "Electrico" Photographic Plate Drier.

on small feet and the bottom is perforated. In the top is a flat chamber with perforations in its lower portion. Fixed to the side is a small motor-driven blower with a heating element in its outlet. The discharge from this is led into the above-mentioned flat chamber, providing heated air, which will dry the plates thoroughly in ten minutes.

Electrically-heated Shaving Outfit.

The shaving outfit illustrated in fig. 3 possesses the feature of novelty. It consists of the usual appliances—a safety razor, brush, shaving stick, spare blades, and a mirror, but in the bottom of the case is fitted a heating element, and the water

Fig. 3.—An Electrically-heated Shaving Outfit.

being placed in an inner shell, is soon brought to the right temperature for use. As the illustration shows, there are three terminals, making the appliance suitable for 110-150-V, or 200-220-V circuits. The device is made by Electrico, Ltd.

A Hand Vacuum Cleaner.

The Wayne Machinery Co., Fort Wayne, Ind., U.S.A., is marketing a new device described as a hand electric vacuum cleaner and motor-driven brush. This machine (fig. 4) is equipped with a standard type brush, driven by a 110-V universal current motor. The manufacturers state that the

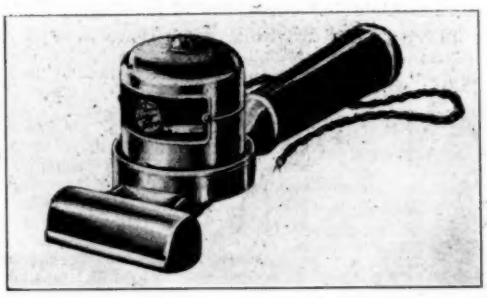


Fig. 4.—A Hand Vacuum Cleaner.

motor will operate on 220-V direct-current in series with a 60-watt lamp, and at any frequency. The discharge is into a dust bag inside the handle. This bag may be cleared by removing the cap on the end of the handle, when, with the motor running, all cleanings are blown outside. An auxiliary dust bag is included as a regular equipment to be employed where it is desired to clean for a long time without emptying. —*Electrical News* (Toronto).

The "Maco" Adjustable Template.

Mr. E. James Brown, the inventor of the "Maco" adjustable template, described in our issue of July 21st, has developed a form of the device suitable for obtaining the profiles of track rails. This consists of two templates mounted in a frame. One of these is fixed, while the other is free to move along the frame, being operated by a hand screw. In use, the movable template is taken out and the frame is put over and under the rail, with the fixed template pressed against one side. The movable part is then replaced, and by

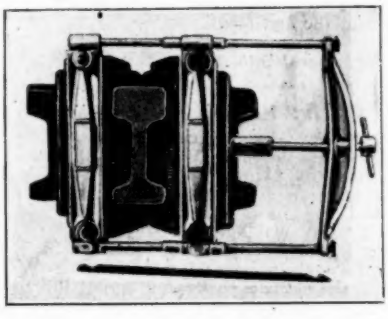


Fig. 5.—"Maco" Rail Profile Templates.

screwing it down the innumerable reeds in each template are forced to take up positions corresponding to the shape of the rail, as shown in fig. 5. Then the movable part can again be withdrawn and the frame slipped off the rail. When the sliding template has been replaced an outline of the rail's shape can be obtained by means of pencil and paper, or a piece of sensitised paper can be placed behind the gap, when the profile will be obtained photographically.

A New Electric Locomotive.—Britain's first high-speed electric railway engine, with a safe maximum speed of ninety miles an hour, and capable of maintaining an average of more than a mile a minute on a long journey, has been delivered to the North-Eastern Railway. The new locomotive, which was referred to in Sir V. Raven's papers in our issues of December 30th, 1921, January 6th, and August 25th, 1922, was made by the Metropolitan-Vickers Electric Company at Trafford Park, Manchester. It will be used, says the *Daily Express*, on the forty-four miles run between York and Darlington, and later for hauling the famous "Flying Scotsman" between York and Newcastle. The new engine, which develops 1,800 horse-power, can maintain high speeds with a load of 450 tons.

FERGUSON-PAILIN ARMOURCLAD SWITCHGEAR.

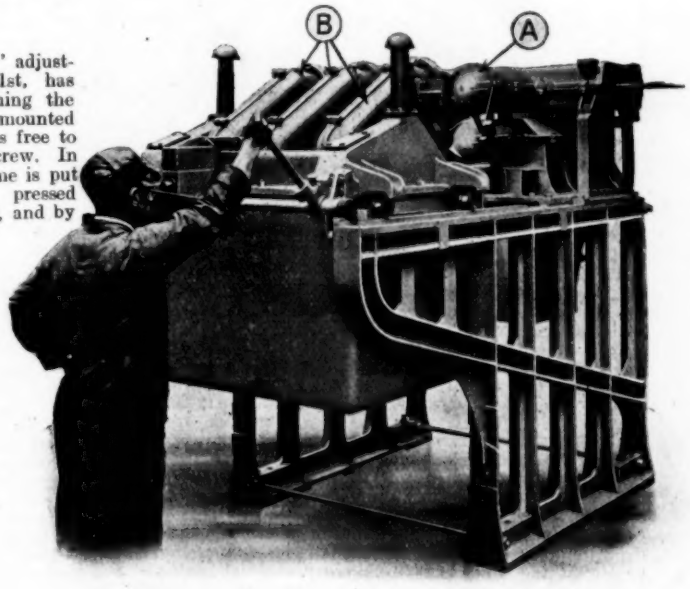
Armourclad switchgear of the totally-enclosed compound-filled type, equipped with 3-phase oil-immersed circuit breakers of 500,000 kVA capacity, has been developed by Messrs. Ferguson, Pailin, Ltd., Manchester, for central station and sub-station use. The basic principle of this class of switchgear is that all "live" apparatus and conductors are embedded in compound or immersed in oil, thus rendering the gear completely self-contained and entirely independent of housing accommodation.

Complete freedom in choice of location is permitted with this switchgear. No brick or concrete cells are required. Valuable floor space may be saved, and building costs eliminated. In fact, being dirt and vermin-proof, and capable of resisting bad atmospheric effects, armour-clad switchgear is equally suitable for indoor or outdoor use. As compared, therefore, with the usual open-type gear, considerable installation costs may be eliminated, which more than compensate for the slightly increased cost of the gear itself.

An oil-immersed circuit breaker, when interrupting large fault currents, is liable to eject oil vapour of a semi-conducting character. With open-type switchgear this is very likely to cause serious trouble, but with completely enclosed armour-clad switchgear such trouble cannot arise.

The only safeguard that can be introduced against electrical surges is the complete enclosure of all conductors, as in armourclad-type switchgear, which is practically immune from danger from this cause.

Armourclad switchgear is built on the sectional principle, enabling single sections to be used when desired, or a multiple switchboard to be built up to any requirements.



A, Shields over stationary (live) contacts; B, armoured moving contacts.

Fig. 1.—Front View.

Each section comprises two main portions: a fixed portion containing the bus bars, cable terminal boxes and oil-immersed instrument transformers, and a movable portion consisting of a carriage-type oil-immersed circuit breaker. When the circuit-breaker carriage is completely drawn out the circuit breaker is isolated and the live contacts on the fixed portion are automatically screened, as shown at A, fig. 1.

Two massive cast-iron brackets form the main structural frame supporting the whole of the equipment. The wide upper surfaces of these main brackets are machined, to form beds for the rails on which ride the rollers of the circuit-breaker carriage. Substantial racking gear is provided to ensure easy movement of the carriage.

The bus bars, which are enclosed in a cast-iron chamber and adequately supported in moulded insulators, are jig-set in position, together with the connections to the isolating plugs; the whole of the space is then filled in with insulating compound of high dielectric strength and high flow point.

In the design special attention has been devoted to the proportioning of the various parts so as to obtain the maximum breaking capacity within given dimensions.

The circuit breaker is built up on a solid steel plate. This supports a tank of welded steel boiler plate, fully capable of withstanding the stresses imposed upon it. A wide machined joint between the tank and the top plate prevents the emission of oil under operating conditions.

Three hood castings contain the projecting insulators sup-

porting the main plug receptacles, which engage with the plugs in the transformer and bus bar chambers. These hoods are separate units bolted to the top plate and filled with insulating compound.

The circuit breaker is of very massive proportions, rendering it eminently capable of withstanding the enormous stresses which occur when interrupting short circuits on systems of large plant capacity. The breaker can be controlled by hand, directly or remotely, or can be electrically operated by a simple electrical solenoid device.

The moving contacts consist of heavy vee-shaped high-conductivity copper bars, the apex of the vee being upwards.

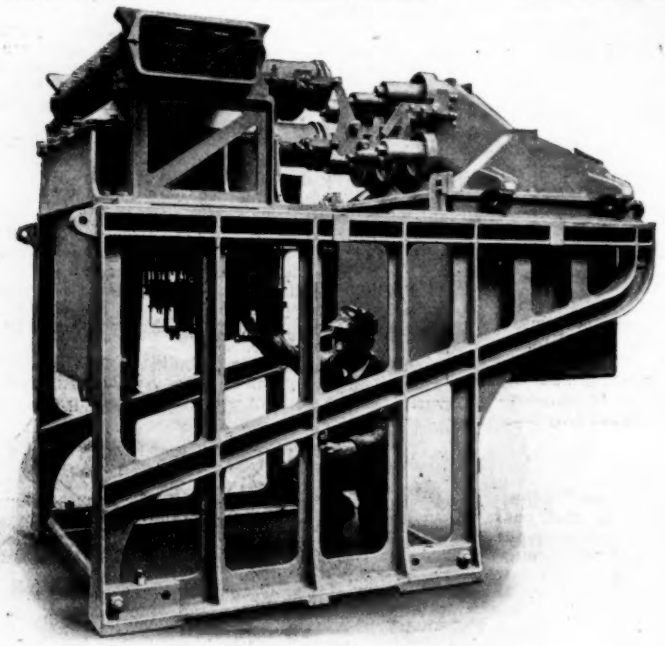


Fig. 2.—Ferguson, Pailin Switchgear.—Side View.

The fixed contacts are of copper loosely supported on the extremities of flat steel springs screwed on to either side of a heavy copper block, into which a substantial hard-drawn stem is screwed and sweated. The current is conveyed from the contacts to the block by means of flexible copper strips.

In closing the switch the apex of the vee-shaped moving contact enters between the contacts, forcing them apart; the contacts, being loosely supported by the springs, are free to align themselves accurately on the contact bar.

Each set of contacts is a unit, the number employed varying according to the current-carrying capacity of the circuit breaker, thus considerably reducing the number of spares required.

The contact fingers form parallel paths carrying currents in the same direction, the electromagnetic forces thereby tending to attract the contacts to each other. This increases the pressure on the moving contact and enables the breaker to pass very much larger transient currents without deformation of contacts.

A detailed technical description of this switchgear is given in a catalogues, section 174/A1, recently issued by Messrs. Ferguson, Pailin, Ltd.

The examples illustrated in figs. 1 and 2 are equipped with breakers rated at a breaking capacity of 500,000 kVA, and are designed for a current of 400 amperes at 44,000 volts, or 1,500 amperes at 22,000 volts.

Exide Wireless Batteries.—The prime necessity in a battery for use with a wireless set is the ability to hold the charge over long periods. It is claimed that Exide batteries do this, and the following particulars may be of interest as showing what can be done in this connection.

In June, 1911, a small 10-ampere-hour 2-volt accumulator in a celluloid box was returned by a customer to the London office of the Chloride Electrical Storage Co., Ltd. This accumulator remained undisturbed on a shelf until September, 1912, when it was found in good condition, but almost without acid. It was refilled and recharged and has been standing on open circuit ever since, receiving a freshening charge about once a year. In February, 1919, it gave 10 ampere-hours at the ½-ampere discharge rate; in February, 1920, it gave 17 ampere-hours at the 1-ampere discharge rate, and in 1922, it gave 19 ampere-hours, so that after remaining for 11 years on open circuit it now gives 90 per cent. more than its listed capacity.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Lightning Conductors of the County Hall.

With reference to Mr. Killingworth Hedges's letter in your issue of August 25th, 1922, I would like to point out that the impression conveyed in the last paragraph of his letter is not correct.

The National Physical Laboratory did not specify the method which has been adopted. The true facts are as follows: A scheme, with estimate, was submitted by the Electrical Department to the Chief Engineer of the Council, which embodied connections to the steel framework only. The data for this scheme were obtained by conducting a series of tests for conductivity resistance to earth between the highest points of the steel framework and the River Thames. The Chief Engineer recognising that it was a question for expert opinion and confirmation recommended that the Council ought to obtain the services of the N.P.L. or such like authority. After the services of the N.P.L. had been obtained, no tests or the like being made by them, a report was received, based on existing textbooks, &c., which recommended the use of "Down Tapes" and "Earths" outside the building and deprecated the use of the steelwork as the conductor system on account of an assumed "condenser effect."

The actual system fitted involves the use of the "steelwork frame" and down tapes, both "earthed" to the water-mains. Subsequently, as time and circumstances permit, river earths may be also fitted.

It is a peculiar fact, in view of Mr. Killingworth Hedges's remarks, that no particulars could be traced when the original tests were made of any building having been previously fitted in the manner which was recommended at the first onset.

Spark.

Westminster, *August 28th*, 1922.

Making Hay the Electric Way.

To those who have been privileged to see the operations on Mr. Borlase Matthews's farm, it is a pleasure to read your article under the above title; but, as the basis of "electro-farming," a sphere of great interest to electrical engineers, must be mainly cost, I venture to ask you to establish the power costs for hay making.

You state: "At 1d. per unit this amounts to 2s. 10d. for the stack, or 1.3 units per ton of cured hay," and further on "The cost of the electric power for drying the hay.....is under 2s. 3d. per ton for power." Which of these figures is the correct approximation?

A fact that appeals to me, but which is not remarked on in your article, is that in the Borlase Matthews method approximately 100 per cent. of the grass mown is converted into sound hay, whatever may be the condition of the weather.

Justus Eck.

Lyndhurst, *August 26th*, 1922.

[Both figures are correct; the 2s. 3d. per ton was obtained in the earlier experiments, and the 1.3 units per ton was the result of the final work and will be the basis of future operations.—Eds. Elec. Rev.]

Import Duties on Machinery for Argentina.—The Government of Argentina is making a determined effort to get a number of secondary industries started in the Republic, and with the view of encouraging capitalists to invest in such enterprises as oil production and refining, cotton ginning, jute manufacture, and so on, will ask Congress either to abolish altogether the import duties on machinery and plant for such purposes, or reduce the duties to a negligible minimum. Pending authority from Congress, the Minister of Finance is now accepting from importers their written guarantee to pay the duties if called upon to do so; meanwhile their machinery is admitted duty free. The Government proposal before Congress is that all machinery, plant and tools imported for use in certain new industries shall be duty free, while raw material from abroad, for local manufacture, shall pay only 5 per cent.—*Reuter's Trade Service* (Buenos Ayres).

BUSINESS NOTES.

Bankruptcy Proceedings.—J. E. Rollinson, electrical engineer and contractor, 5, Tavistock Chambers, Beastmarket Hill, Nottingham.—Trustee, Mr. H. F. Holloway, Bentinck Buildings, Wheeler Gate, Nottingham, appointed August 23rd.

W. Hill, seedsman and electrician, 3a, Leigh Road, Leigh, Lancs.—First and final dividend of 2s. 9¼d. in the £, payable September 4th at the Official Receiver's offices, Byrom Street, Manchester.

W. H. Borrows, engineer and electrician, Werrington, Northampton.—First meeting September 5th, at the Official Receiver's office, 5, Petty Cury, Cambridge; public examination, September 22nd, at the Law Courts, Peterborough.

F. A. Watkins, electrical engineer, 57, High Street, Hythe.—Trustee: Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., appointed August 26th.

B. T. Dale, electrical engineer, Erick Street, Newcastle-on-Tyne.—Last day for proofs for dividend September 16th. Trustee: Mr. W. Brittain, 4, Northumberland Street, Newcastle-on-Tyne.

T. Scott & J. Campbell (T. Scott & Co.), wholesale electrical suppliers, 42, Handyside's Arcade, Percy Street, Newcastle-on-Tyne.—Last day for proofs for dividend, September 16th. Trustee: Mr. W. Brittain, 4, Northumberland Street, Newcastle-on-Tyne.

Company Liquidations.—British Railway and Tramway Interchangeable Rail Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. A. Hitchins, 16, Waterloo Street, Birmingham.

Eclipse Carborundum and Electrite Co., Ltd.—A meeting of members is called for September 29th at 62, New Broad Street, E.C., to hear an account of the winding-up from the liquidator, Mr. G. Lord.

Fuller's United Electric Works, Ltd.—A petition for the winding-up has been presented to the High Court by Messrs. W. S. Caines, Ltd., of Andover House, The Broadway, Plaistow, Essex. Creditors of the company will be heard in London on October 17th.

Solectric Co., Ltd.—Particulars of claims to be sent to the liquidator, Mr. F. N. Clarke, 4, Pavilion Buildings, Brighton, by September 30th.

Dissolutions of Partnership.—Holmes & Co., ironmongers, mill furnishers, and electrical engineers, 181, Manchester Road, Mossley.—Messrs. J. H. & C. E. Holmes have dissolved partnership. Debts will be attended to by Mr. J. H. Holmes, who will continue the business.

Star Delta Wireless Supply Co., wireless specialists, 333a, Oxford Road, Manchester.—Mr. J. Griffin and Mr. J. O. Nichol have dissolved partnership. Mr. Griffin will attend to debts.

Trade Announcements.—The Advance Machinery Co., Higher York Street Works, C.-on-M., Manchester, has increased its automatic plant for the manufacture of terminals and turned washers suitable for the wireless and general electrical trade.

The Consolidated Pneumatic Tool Co., Ltd., of 170, Piccadilly, London, W., has been appointed sole selling agent for the British Empire and the Continent of Europe for the Duff Manufacturing Co., makers of the Duff Genuine Barrett and Duff lifting jacks, and the Duff Dunn patent trench braces.

Messrs. J. S. Peckham & Co., 405, New Compton Street, W.C.2, have been appointed sole agents for the British Isles and Dominions of the following Swedish firms: Elektriska Aktiebolaget Eck (motors, generators, switchgear, &c.); Jonkopings Mekaniska Werkstads A.B. (turbines up to 8,000 kW); and Aktiebolaget Pumpindustri (motor-driven pumps).

The Midland Electric Manufacturing Co., Ltd., has appointed Messrs. Campbell, Gardner & Co., of 44, Upper Arthur Street, Belfast, as its agents for Belfast and the north of Ireland. A stock of the full range of "M. E. M." switch- and fuse-gear will be kept at this address.

The Sevenoaks and District Electricity Co., Ltd., has now opened a showroom at Oxted, and will be pleased to hear from manufacturers prepared to lend apparatus for show purposes.

Mr. Edgar W. Dorey, Norwich House, Southampton Street, High Holborn, W.C.1, has been appointed sole agent for the United Kingdom for the Anglo-Belgian Co., Ltd., makers of semi-Diesel crude oil engines.

Catalogues and Lists.—Dugdill's Patents, Hazel Grove, Stockport.—A mailing card, illustrating numerous electric light fittings, telephone extension arms, &c.

Messrs. William Patterson, Ltd., Walker Gate, Newcastle-upon-Tyne.—A price sheet giving particulars of "Matchless" self-lubricating dynamo and other types of brushes.

Engineering Supplies, Ltd., 155a, Upper Thames Street, E.C.4.—A net trade price list of cables and wires of many types.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Folder No. K2,767, giving illustrations and prices of private telephones for domestic and office use. Leaflet No. K2,768, dealing with G.E.C. "Auto-reset" intercommunication telephones.

The Cable Accessories Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.—Three illustrated and priced lists dealing respectively with "Revo" electric fires, lighting, and general accessories, and small switch and fuse gear.

Messrs. C. E. Lugard & Co., Ashover, near Chesterfield.—An illustrated booklet describing the "Vulcan" electro-magnetic clutch drive for machine tools; a description of an instrument for measuring the speed of cuts by means of a motor shunt current also appears.

The Record Electrical Co., Ltd., Broadheath, Manchester.—An illustrated and priced catalogue giving full details of electrical measuring instruments of numerous types, circuit breakers, automatic cut-outs for charging purposes, &c.

Sterling Telephone & Electric Co., Ltd., 210-212, Tottenham Court Road, W.1.—Publication No. 238, an illustrated card giving instructions for the use of "Magnavox" loud speakers and amplifiers.

Electro-Dynamic Construction Co., Ltd., 4, New Cross Road, S.E.4.—An illustrated pamphlet dealing with electric arc welding plant.

Measurement, Ltd., 34-38, Provost Street, City Road, N.1.—List D, illustrating and describing a d.c. mercury motor ampere-hour meter for house service.

British Insulated & Helsby Cables, Ltd., Prescot, Lancs.—Publication No. P.175, describing the application of Dickinson's patent cover to joint boxes.

For Sale.—By direction of the Disposal Board, Messrs. G. N. Dixon & Co. will sell by auction on September 26th and following days at H.M. Factory, Queensferry, plant and machinery, including electric motors, transformers, cables, &c.

Bristol Corporation Electricity Department has for disposal one surface condenser, 1,460 tubes, complete with valves, &c.

Messrs. Edge & Burt, liquidators of Messrs. H. Allday and Son, Ltd., manufactureres of metalware for the electrical trades, &c., of Connaught Works, Holdford Road, Witton, Birmingham, invite offers for the business, plant, stock, and premises as a going concern.

Messrs. Goddard & Smith will sell by auction on September 4th, at Seymour Place, Bryanston Square, W., lead-covered and armoured cable, &c.

Todmorden B.C. has for disposal one 150-kW Bruce Peebles generating set, condensing plant, pump, tanks, &c. (See our advertisement pages to-day.)

Shortage of Iron in Germany.—According to the *Deutsche Bergwerks Zeitung* of August 18th, forwarded to the Department of Overseas Trade by the Commercial Secretary at Cologne, the iron shortage is taking more and more alarming proportions. Consumers are complaining that there is hardly any material to be obtained, as the works are still occupied for months ahead with the execution of orders received during the last few months. Where new orders are taken, four to six months' delivery is required.

German Price Increases.—The Commercial Secretary at Cologne informs the Department of Overseas Trade that the Central Union of the German electrotechnical industry has decided to increase prices, with effect as from August 11th, by an average of 40 per cent.

The A.E.G. in Holland.—It is reported from Amsterdam that the Berlin A.E.G. has formed the Elektricitats Mij-A.E.G. in Amsterdam, with a paid capital of 200,000 florins, to promote the interests of the German company in Holland.

Price of Electrolytic Copper in Germany.—According to the *Boersen Courier*, the Association for German Electrolytic Copper has fixed the electrolytic copper quotation to-day at 40,306 marks per 100 kg.—*Reuter's Trade Service* (Berlin, August 19th).

Annual Outing.—A section of the staff and employés of the South Shields Electricity Department held their first annual excursion on August 23rd, accompanied by the chairman (Ald. J. W. Henderson, J.P.), and the vice-chairman (Councillor J. Wilson) of the Electricity Committee, together with the borough electrical engineer (Mr. James Edgar). Leaving South Shields in one of the Tramway Department's saloon motor buses, the party journeyed to Wooler, where dinner was provided at the Temperance Hotel. After spending a short time in Wooler, the party proceeded to Alnwick. A tour round this ancient and historical town was followed by tea at the White Swan Hotel. Favoured by good weather, a most enjoyable day was spent, the party arriving back at South Shields about 10 p.m. A second section will carry out a similar programme on September 6th.

Copper and Lead Prices.—Messrs. F. Smith & Co. report August 29th:—Copper (electrolytic) bars, £70, £1 decrease; do. do. sheets, no change; do. do. wire rods, £79, £2 decrease; do. do. h.c. wire, 10½d., ¼d. decrease.

Messrs. James & Shakespeare report August 30th:—Copper bars (best selected), sheet and rod, no change; English pig lead, £25 10s., 10s. decrease.

A Recent German Contract Ruling.—U.S. Commercial Attaché C. E. Herring, at Berlin reports:—

"As has been pointed out in several dispatches and articles in *Commerce Reports*, German practice with regard to contracts permits certain deviations from contract clauses as the result of changed conditions that intervene at some time after the signing of the contract and before the date of performance. This is known as the Preisfreibleibend clause.

"In a recent case the defendant had signed a contract whereby he had agreed to sell at a fixed price his shares in business within a period of six months. When the contract was due he refused to uphold it on the ground that the depreciation of the mark had so changed economic conditions that the agreement no longer represented a sufficiently fair exchange of values to enable him to fulfil his obligations. The court upheld this action of the defendant, and through its decision declared it to be legal to withdraw from a contract when the parties had mistakenly assumed that, on the date when due, the contract would provide for a fair exchange of values. The court furthermore emphasised in this decision the fact that a currency depreciation is sufficient cause to make the exchange of values sufficiently unfair to warrant the repudiation of a contract.

"This decision is important from two points of view. In the first place, to date the courts have generally held that a contract can be repudiated only when its fulfilment is adjudged by the court to be impossible, whereas with this recent decision the precedent is set that a contract can be repudiated if the court adjudges conditions no longer to warrant a fair exchange of values. In the second place, this decision sets the precedent that the depreciation of the currency is in itself a sufficient cause to create unfair conditions of exchange. In former cases the court accepted increased wages, freight rates, production costs, and other factors brought about by the currency depreciation as sufficient causes to change the terms of the contract but never the currency depreciation in itself."—*U.S. Commerce Reports.*

Forthcoming Exhibitions.—The following exhibitions are being organised:—

London.—September 30th to October 7th, Wireless Exhibition; October 13th to 23rd, Commercial Motor Exhibition; October 28th to November 3rd, Brewers' Exhibition; November 2nd to 11th, International Motor Show; November 14th to 24th, Marine and Small Craft Exhibition; November 25th to December 2nd, Motor-Cycle and Cycle Show.

Birmingham.—February 19th to March 2nd, 1923, British Industries Fair.

Manchester.—October 6th to 20th, Textile Machinery Exhibition.

Belgium (*Mons*).—November, Commercial Fair.

France (*Paris*).—December 15th to January 2nd, 1923, International Aero Show.

United States (*Chicago*).—October 14th to 22nd, Radio Show.

A Prosperous Austrian Undertaking.—The report for 1921 of the "Elin" Aktiengesellschaft für Elektrische Industrie shows unusual progress in the year under review and far-reaching plans for future operations. In the past year a lively demand for the firm's products was experienced. The works at Weiz, the project department and the sales organisation each obtained ample business. Compared with the year 1914, production was almost threefold, and, contrasted with 1915, eightfold. The high-pressure department in the past year found valuable openings for its activities. The 100,000-V line, the first set up in Austria, mentioned in the report, had given the fullest satisfaction. Further, the same department secured from the Swiss Ministry of Traffic the contract for the complete sub-station equipment of the Arlberg railway at Zirl, Floppen, and Flirsch. These contracts are now in full swing. Of the big schemes mentioned in the last report in connection with the development of Austria's water resources and the electrification of the railways, some had been realised, and fresh ones were under negotiation. As regards the firm's own works, only three are now retained, namely, those at Mixnitz, Wadowice and Ragusa. The Lugos works were advantageously disposed of to a foreign group. The sales organisation opened a branch at Milan, which had appointed agencies in various Italian cities. Agencies had also been instituted in Rumania and Poland, the working of which was very satisfactory. The office at Brux had suffered somewhat from the prevalent stagnation in Czecho-Slovakia. On January 1st, 1922, the "Elin" Gesellschaft m.b.H. Marburg began its operations. This company, which was constituted with the co-operation of Jugo-Slavic Banks under the direction of the Laibach Credit Bank, has a fully-paid share capital of 900,000 Jugo-Slav kronen. Furthermore, there was formed at Zagreb, the capital of Croatia, the "Fulgur" Jugoslavische Gesellschaft für Elektrische Unternehmungen, with a capital of 10,000,000 Jugo-Slav kronen. Croatian, Viennese, and Serbian banks assisted in its flotation, and took up parts of the capital. This company is intended in the first line as a financing company for the acquisition and working of power stations or shares in such enterprises. For the working of the Croatian and Serbian territories in union with the forenamed, another company was formed in the beginning of 1922 at Zagreb, styled the "Elin" Jugoslavische Gesellschaft für Elektrische Industrie, with a capital of 5,000,000 Jugo-Slav kronen, and is now actively operating. The company formed in Holland to promote export trade in the west, the Nederlandsche Maatschappij voor Electrische Industrie, Amsterdam, is developing favourably. Relations with the "Kontakt" A.G. Spezialfabrik have developed; this company produces high-pressure electrical plant of all kinds, and is able to record increased business, with improvements and extensions of plant. Its connection with the Weiz works has been proved of value. The "Kontakt's" capital was raised in the first year from 4,000,000 to 10,000,000 kronen. The Möllersdorf Foundry Co. has likewise benefited greatly in the past year from the orders received from the Weiz works. The Telephon-Automaten Gesellschaft has had to suffer during the year from the increasing depreciation of the currency, which corresponded with a decreased use of automatic telephones. For the working of the automatic telephone business in Czecho-Slovakia, a company has been formed, with a capital of 3,000,000 Czech kronen. Its business, which extended throughout the Czecho-Slovak territory, had been satisfactory. The "Meteor" Gluhlampenfabrik, in which the firm had a share, was also able to give a good account. The Elektromos ipar r.t., in Budapesth, was able to distribute a dividend of 10 per cent. in 1920. With respect to the distribution of the net profit of 31,069,567 kronen, it was proposed to allot 5 per cent. to the reserve; 2,000,000 kr. to the Ingenieur Franz Pichel Fonds; and 5 per cent. to the holders of shares. Of the balance, 10 per cent. would be apportioned to the directors, 45 per cent. super-dividend at the rate of 90 kr. per share to the shareholders, and the balance caried forward. On the strength of a resolution of an extraordinary meeting in January, 1922, a further increase of the share capital from 45,000,000 to 90,000,000 kr. is to be made, by the issue of 225,000 shares, bearing dividend from January 1st, 1922.

Business Prospects in Canary Islands.—*Commerce Reports* publishes a statement from the U.S. Consul at Teneriffe regarding trade prospects in the Canary Islands. It is stated that individual lighting installations and farm lighting plant are used to a very limited extent. There are probably not over half-a-dozen in the islands. It is probable that there would be a market for installations in villages with from 500 to 2,000 inhabitants. Nearly all towns with a population of over 5,000 already have electric light. There apperas to be a good opportunity for the sale of pumping plant.

Use of Cable Codes in Tenders.—In a recent dispatch to his Government, U.S. Vice-Consul Russell M. Brooks, of Newcastle-on-Tyne, states: "Trade opportunities usually specify the cable code used by the person desiring tenders, its name being listed under the column "telegraphic codes." English firms, as a rule, employ but one such code, and a reply received in any other code is a source of delay and of annoyance that may easily result in the loss of an order. Many firms in England are so located that copies of all the codes in use are not available, and cases have occurred recently in which it was necessary for the recipient of a cablegram to telegraph it to one of the principal commercial centres in order to have it decoded. The additional expense, the time lost, to say nothing of the annoyance caused and the possibility of errors in two additional transmissions, may easily be sufficient to prejudice the English firm against a tender made in such a form. One instance in particular is reported in which the original tender was made in the proper code and an order was placed with the American exporter. In cabling confirmation of the order the American company used a totally different code, in spite of the fact that it had been advised of the particular code employed and had used it in its first message. The code used in the confirming message was not available in the town where the English customer was located, and the entire message had to be telegraphed to Liverpool, decoded, and sent back in plain English over the wire. New codes are being prepared and advertised from time to time, and trade associations are making up codes suited to their own peculiar needs, so that a considerable number exist in different languages. This is a detail deserving of special attention, not so much for the slight difference in the expense, but for the confusion caused by the selection of an unusual code for commercial messages."

Australian Labour.—A conference of 62 trade unions assembled at Sydney to formulate opposition to reductions of wages and altered working conditions, has advocated a policy of "go slow" and "measure for measure," and has also recommended all Australian unions to act similarly.—*Reuter.*

An Exchange Telegraph dispatch from Melbourne states that since 1913 the Commonwealth industrial disputes have numbered 3,791, resulting in a loss of 18,000,000 working days and £11,000,000 in wages.

British Empire Exhibition.—The Government has decided to devote £60,000 to the New Zealand Section at the British Empire Exhibition. The Dominion will also participate in the Imperial sections with a portion of the allocation available this year. The committees have already begun to organise.—*Reuter* (Wellington).

German Railway Rates.—Owing to the further depreciation of the mark, the recent increase of 50 per cent. in railway goods rates, which will come into force on September 1st, is now considered insufficient and a further increase may become necessary.—*Reuter* (Berlin, August 22nd).

South African Electrical Prospects.—The American Vice-Consul at Cape Town, writing in *Commerce Reports*, makes some interesting remarks on the market conditions in Cape Town as regards electric heaters, irons, and toasters. The absence of central heating from most buildings, and of any kind of heating in many offices, causes a good demand for electric heaters. Those most favoured are the 1-kW size with coiled wire elements. There are still some of the large lamp-type sold. Heaters priced at about $15 (£3 6s.) have the best sale, and most of these are British. Heaters consuming more than 1 kWh per hour are practically unsaleable. The former American monopoly of the supply of electric irons has been almost "killed" by the recent reductions in the prices of English irons and the re-entry of Germany into the market. The average retail prices of a 5-lb. iron are: American, $9.50; English, $8.50; and German, $7. Dealers state that more German irons are being sold than all the others put together. The report says that unless American manufacturers can bring their price down to $8 the market will be entirely lost to them.

The Americans supply practically all the electric toasters sold in Cape Town, there apparently being no German toasters, and the English makes being much inferior to American makes at the same price. Sales could be increased by lowering the price from $9, which is the average. The high prices charged for spare parts for American appliances are against their sale in South Africa, and dealers say that American prices have not been reduced at the same rate as English prices. The report concludes that unless American manufacturers can materially reduce their prices they will be forced out of the market by English and German competition.

Trade Conditions in South Africa.—The general managers of the Standard Bank of South Africa communicate the following information regarding business conditions in South Africa during the past month:—

The volume of business shows little change during the month, although a continuance of the satisfactory agricultural conditions and the notable progress in the gold-mining industry tend to foster optimistic views regarding the immediate future.

In electrical goods, business is fair and prices are unchanged. Stocks are generally good, although supplies of ordinary lamps are dwindling in consequence of the recent heavy demand.

The trade figures for British South Africa for the five months ended May, compared with the corresponding period of last year, are as follows:—

	First Five Months.	
	1922.	1921.
Imports	£20,570,506	£29,521,149
Exports, including re-exports ...	£21,765,312	£25,611,999

—*Reuter's Trade Service* (Cape Town).

Local Electrical Exhibitions.—With reference to the note under the above heading in our last issue, we are informed by the E.D.A. that the Warrington Exhibition Committee has now definitely decided to hold the show from November 2nd to 11th, instead of November 27th and following days, as first suggested.

An Ideal Home Exhibition is being held at Bognor from September 6th to 30th.

We have received from Mr. John Christie, engineer and manager of the Brighton electricity undertaking, a copy of the poster being employed to advertise the electrical exhibition which is being held in the Corn Exchange, Brighton, from October 5th to 14th. It is an "attention-compelling" design which should secure its object.

New Canadian Companies.—Among the new companies recently incorporated in Canada are: La Compagnie Hydraulique de Portneuf, Ltd., Quebec (capital, $300,000); Radiophone Corporation of Canada, Ltd., Toronto (capital, $500,000); and Crescent Electrics, Ltd., Toronto (capital, $100,000), manufacturers and suppliers of machinery and apparatus.

Manufacturing in Russia.—It is reported that all the departments of the Siemens-Schuckert works in Petrograd have recently been in operation, and the production is said to have exceeded the pre-war output by 25 per cent. In May the output of electrical supplies was valued at 65,115 pre-war roubles. The North State works produced similar articles for 106,052 pre-war roubles, and No. 7 works, "Deka," for 57,135 pre-war roubles, whereas in April the latter scarcely turned out 12 per cent. of the pre-arranged programme. The value of the May production of the glow lamp factory, Swiedtjana was 16,996 pre-war roubles, that of the Fittings works was 4,489 roubles, and that of the No. 6 works, F.A., was 9,099 pre-war roubles. In the case of the Petrograd accumulator trust the output in May and June is returned at 88,846 pre-war roubles, being double the amount of the preceding two months.

Blackburn Contractors' Action.—Competition has become so keen in the electrical business of the East Lancashire district, consequent upon so many unqualified men starting in the business, that the Blackburn and District Electrical Contractors' Association has published a notice intimating to the public who its members are, with their qualifications.

French Locomotive Orders.—It is reported from Paris that the Compagnie Electro-Mécanique has just received an order for the supply of the electrical equipment for 120 locomotives for the Paris-Orleans Railway Co., at a cost of about 20,000,000 fr. Including similar orders previously obtained for other French railways, the total value of the contracts on hand reaches 70,000,000 fr.

German Goods Credit to Russia.—The official Rosta agency of Moscow reports by wireless that the Russian Foreign Trade Commissariat has given permission to the Russian Electrical Trust to enter into an agreement with the "Siemens works in Germany," under which the latter would grant credit to the trust in goods. It is added that this is the first time that a foreign firm has given credit to Russian industry. It is, however, not stated whether the German firm has expressed its willingness to conclude such an agreement.

Lead.—Under date August 26th, Messrs. James Forster and Co., report as follows: "Closing prices yesterday were £23 7s. 6d. for August and £22 15s. for November, against £24 15s. and £24, respectively, at the end of last week. A month ago, the relative positions were at £25 15s. and £24 12s. 6d. Transactions have been on a liberal scale and approximate to 5,500 tons for the week, most of which appear to be of a speculative nature. Lead is coming in more plentifully and there is more afloat than has been the case in late months."

The Dutch East Indian Market.—Vast developments have taken place in the Dutch East Indies during the past ten or twenty years which have rendered these islands a valuable market for machinery. During 1919 and 1920, such imports, consisting largely of sugar machinery, agricultural and estate machinery, and hand and machine tools, amounted in value to over £10,000,000. It is true that the demand then was exceptional, due to shortage during the war, and a reaction has since taken place. Now, however, there seems every prospect of Holland's island possessions resuming their path of progress.

The British Commercial Agent at Batavia (Mr. H. A. N. Bluett) is very enthusiastic about the possibilities of British trade in this territory, but with regard to machinery, he says that British manufacturers must endeavour to reduce their costs of production.

Czecho-Slovakia's Sound Currency. — Czecho-Slovakia stands out strikingly from the other new Central European States by reason of the sustained effort she has made to place her finances on a sound basis. Through steadily refusing to inflate her currency by means of the printing press, she has brought about a remarkable appreciation of the exchange value of her crown. Indeed, so rapidly has it risen, that her export industries have been embarrassed. While sympathising with a people who are suffering inconvenience because they have chosen the proper, though temporarily harder road, there is no need to assure them that their ultimate gain will be the greater for their boldness.

Czech manufacturers who, as Mr. Bruce Lockhart (H.M. Commercial Secretary at Prague), points out in his recent report, depend upon export trade in much the same way as British industrialists, are now actively engaged in reducing their costs of production. Apparently, they must also diminish their margin of profit, improve their organisation, and possibly induce their Government to bring down some of the highly-protective import duties that are levied on goods which affect the expenses of manufacture.

Czecho-Slovakia's import and export trade last year with her chief customers in electrical apparatus, is shown below:—

	Czech Imports. Quintals = about 2 cwt.	Czech Exports. Quintals = about 2 cwt.
Electrical machines and goods—		
Total	64,000	17,000
Germany	31,000	1,000
Austria	28,000	5,000

Czecho-Slovakia's exports are naturally also directed to the neighbouring states of Jugo-Slavia and Rumania, as well as Italy. With regard to the prospects of trade with Great Britain, H.M. Commercial Secretary points out that it has always been recognised that Czecho-Slovakia does not, and cannot, present a very wide field for the export of British manufactured goods. The country itself manufactures for export, many, if not most, of those manufactured articles which form the staple export commodities of Great Britain. There should be a fair opening for British goods of the highest quality, but at the present moment, the State control of commerce makes their introduction almost impossible.

A Trade Union Amalgamation.—It is reported that a ballot of members of the Municipal Employés' Association, the National Amalgamated Union of Labour, and the National Union of General Workers, upon a proposal to combine the three unions in one society, has resulted in a majority favourable to the arrangement. If the fusion is carried into effect the new union will be the largest in the country with a membership of over half a million. A further development of this nature is mooted by which the Transport and General Workers' Union and the National Union of Sailors and Firemen would combine.

Book Notices.—The *Bulletin* of the Hydro-Electric Power Commission of Ontario, July, 1922. Toronto: The Commission. Price $2 per annum.—The whole of this number is devoted to the proceedings of the Association of Municipal Electrical Utilities held in June. Among these are two papers on street lighting, one dealing with the allocation of charges in municipal undertakings, and others dealing with questions affecting the industry in many ways.

We have received from the Swedish Consul-General in London a copy of "A Book About Sweden," an extremely interesting and informative guide published by the Swedish Traffic Association, Stockholm. This work is not written on the usual guide-book lines, but covers a wider field. In it are given in an interesting way particulars geographical, historical, and economic, as well as notes on the nation's culture of literary and artistic subjects. Each industry is made the subject of a brief note, and the electrical section is illustrated with a view of the generating room of the Tröllhattan hydro-electric works, and a picture of the huge rotor of a 30,000-h.p. generator at Västeras. The illustrations throughout are very clear, and show the beauties of the country in an excellent way. The book is clearly printed on good paper, misprints are remarkably rare considering that the book was produced in Sweden, and upon the whole we think that the contents deserve something better than the paper cover in which the pages are bound.

"Labour Policy, False and True," by Sir Lynden Macassey. Pp. 320. London: Thornton Butterworth, Ltd. Price 7s. 6d. net.

"Electrical Circuits and Connections," by W. R. Bowker. Pp. xii+211; 166 figs. London: Crosby Lockwood & Son. Price 15s. net.

"Dictionary of Applied Physics," by Sir R. Glazebrook. Vol. II. Electricity, pp. 1,104, illustrated. London: Macmillan & Co., Ltd. Price 63s. net.

Financial Times "Income Tax Guide for 1922," by H. W. Palmer. Price 1s. net.—This guide explains the essential points of the last Finance Act, showing by test examples and tables what income tax to pay and how to obtain relief; chapters are also given on excess profits tax and the corporation tax.

New South Wales Industry.—The *Times Trade Supplement* states that important legislation relating to trade and commerce, vitally affecting the economy of the State, will be the feature of the present session of the New South Wales Parliament. As a first step, the Fuller Government has Government. ordinarily would expire at the end of this year. Trade (basic-wage fixing tribunal), but not to abolish it as threatened. It will be deprived of all power to fix a basic wage for rural workers, and special tribunals may function at short notice to award wages lower than the basic wage where industries cannot afford to pay them. This will enable the absorption of large numbers of the unemployed at "living" as opposed to "basic" wages.

The Profiteering Prevention Act passed by the late Labour Government, ordinarily would expire at the end of this year, but it has been decided to abolish it at once. This cumbersome piece of legislation will be replaced by a measure designed to prevent price-rigging by trusts and combines.

The Government has been taking careful stock of the various State industries established by the late and previous Labour Governments. It is intended to sell most of these State enterprises and to confine the operations of others to the supply of purely State requirements. The non-paying concerns will be shut down or sold as soon as possible.

The Midland Electrical Trade.—A Midland correspondent writes:—Until recently the general electrical trades were a bright spot in Birmingham and Midland industry, but they are now suffering from a relapse. The competition, particularly in the matter of small electrical fittings, from Germany and Japan is severe, but the quality of the imported goods is poor generally. Germany is, in fact, less competitive in higher-class articles than many people imagine. As might be expected with the approach of autumn, some fairly good orders have been placed for electrical fittings, for domestic lighting, and switch manufacturers and the like report rather improved trading, but most of the Midland factories are only partially employed. The large engineering houses, too, are only moderately employed on power-station and hydro-electric plant, the latter chiefly for Australasia. Developments in the home trade will, of course, be largely influenced by the rate of recovery of the general engineering trades, which so far has proved slow. At the moment it is slightly better, and the merchants report some improvement in the demand for constructional steel. One point for satisfaction is that manufacturers are in a better position, consequent on wage adjustments, than they were recently to quote firm prices on a reduced level. Customers would not buy while values were so high or while the market was falling, so that with costs becoming a little more stabilised, the outlook should improve. At any rate, that is the opinion of representative electrical engineers.

Storage Battery Price Reduction.—We are informed that, as from to-day, the Chloride Electrical Storage Co., Ltd., is reducing the prices of all classes of its stationary storage batteries.

A Warning to Prospective Consumers.—The E.D.A. has sent us a copy of a notice being published by the Midland Electrical Corporation for Power Distribution, Ltd. This warns prospective consumers to make immediate application if they wish to be connected before winter sets in. Last year many applications were so late that the season was well advanced before the applicants could be supplied with electricity.

The Leipzig Fair.—The exchange position has had a pronounced effect upon the Fair, which opened on August 28th. Owing to the instability of the mark, German exhibitors have adopted the practice of concluding sales based upon the currency of the country to which the goods are sold, or, in many cases, upon the pound sterling, the dollar, or the Swiss franc. Because of this, large numbers of German buyers are unable to do business, and vigorous protests have been the result, as, of course, it is impossible to maintain a constant relationship between the mark and foreign currency. There are about 13,000 exhibitors at the Fair, and the visitors who attended upon the first day numbered over 100,000.

LIGHTING AND POWER NOTES.

Aberayron.—Electricity Scheme.—Application has been made to the Electricity Commissioners by Mrs. E. G. Richards, of Llyswen House, Aberayron, for authority to generate and supply electricity for all purposes within the urban district of Aberayron.

Accrington.—Extension of Supply.—The Electricity Commissioners have made a Special Order authorising the supply of electricity to Oswaldtwistle for both public and private purposes, and the approval of the Ministry of Transport is now being obtained.

Argentina.—Hydro-Electric Concession.—The Governor of Mendoza has presented a project to the Provincial Legislature for the granting of a concession, in public tender, for the utilisation of the Nihuil Falls on the River Atuel for the generation of electrical energy. The successful applicant would have to undertake to carry out the work in return only for the right to exploit the service for a term of years, on the expiry of which the whole installation would become the sole property of the Province. Interested parties would be required to state: (1) for how many years they ask the working rights; (2) the tariffs they would propose to charge; (3) the percentage of profit they would give to the Provincial Government. The project stipulates that the tariffs for electric power should not exceed the equivalent value of Argentine petroleum in Buenos Aires, plus cost of transmission. The firm obtaining the concession would be exempted from payment of Provincial and municipal taxes in respect of the establishment. It is anticipated that the energy obtained from the utilisation of the Falls would be anything between 10,000 and 100,000 h.p., the latter figure being conditional on the construction of a reservoir.—*Review of the River Plate.*

Athy (Co. Kildare).—Electricity Scheme.—At a meeting of the Urban Council objections to the electric lighting scheme were heard and met, the engineer being assured of every support. Inquiries regarding a suitable power station site were ordered to be made.

Australia.—Victoria.—The Melbourne *Age* states that no steps have yet been taken by the State Electricity Commission in connection with the amalgamation and standardisation of the supply systems in the Metropolis. So far the activities of the Commission have been confined to the supplying of electricity in bulk from the Yallourn and Newport stations. Only in a small district is electricity supplied to the actual consumers, and the Commissioners do not contemplate retail distribution at the present time. Until the whole matter has been fully considered and legislative powers reviewed it will be impossible for the Commissioners to formulate a policy.

New Supply Schemes.—Permission having been granted it to erect overhead electric mains, the Rockhampton City Council is about to approach the Queensland treasurer for authority to borrow £100,000 to supply electricity to the city and to electrify the tramways. The City Council at Bathurst (N.S.W.) has adopted an expert report on an electricity supply scheme for the city, and has decided to raise a loan of £40,000 to carry out the undertaking.—*Reuter's Trade Service.*

Barnstaple.—Offer to Purchase Undertaking.—It is stated that a syndicate—whose name has not been disclosed—has offered to purchase the municipal electricity undertaking. So far the Council has not decided whether to proceed with negotiations or not.

Barrow.—Electricity Schemes.—The Corporation has commenced to lay conduits for the high-pressure cable which will feed overhead lines to be constructed to carry energy to the suburbs of Rampside and Roa Island, over three miles distant. At present there is neither gas nor electricity at Rampside, where the residents have to burn oil, but at Roa Island there has for many years been a supply of gas from the Furness Railway Co.'s plant, which, however, the com-

pany has decided to discontinue owing to its being unprofitable. It is expected the electricity supply will be available for the two places named before Christmas. Negotiations are also proceeding between the Barrow Corporation and the neighbouring authorities of Dalton and Ulverston with a view to the supply of electricity to these towns. A special inducement to proceed with the work just now is that it would afford considerable employment for the many electricians formerly employed at Messrs. Vickers, who are now idle owing to the slump in trade.

Biggleswade.—Canvass of Residents.—The Urban District Council is circulating letters to residents asking them to what extent they would take electricity if it were available. If the Council is unable to carry out a scheme itself, the information will be placed before any company which may be interested.

Blackpool.—Loan.—The Electricity Committee is urging the Electricity Commissioners to issue sanction in respect of the Corporation's application, in May last, for a loan to carry out the proposed electricity extension scheme.

Brighton.—Breakdown.—The Southwick district was deprived of power on the afternoon of August 22nd, owing to the breaking down of two motor-generators in the sub-station. Tramcars came to a standstill and several works were stopped. Repair work was carried out very quickly by Mr. Christie and his staff, and the supply was re-established in about ten minutes.

Canada.—British Columbia.—The contract for the enlargement of the power storage dam at Ocean Falls has been awarded to Messrs. Robertson & Randell by the Pacific Mills, Ltd. The work involves raising the height of the existing water storage at the outlet of Link Lake, and will cost approximately $250,000.—*Reuter's Trade Service* (Vancouver).

The British Columbia Electric Railway Co. has large construction works in hand and is spending $1,000,000 on increasing its storage capacity at Stave Lake. It has under consideration plans involving an additional expenditure of some $10,000,000 on further development as the increase in population and industrial demand warrants. The installation of a fourth generator of 13,000-h.p. capacity at the Stave Lake plant is almost completed, bringing its total power plant capacity up to 136,000 h.p. Under the plans now in hand it is the intention to make provision for a fifth generator. The power resources of the company available for development include water rights on Alouette Lake, water rights farther down the Stave Lake, and on Jones Lake. These projects, when completed, will provide 150,000 h.p., sufficient to supply Vancouver and the lower mainland of the province for a considerable time.

Vancouver and New Westminster are developing apace as industrial centres, and with the exception of lumber mills and other industries which develop power from waste fuel, every industry needs electric power. The demand for power has been increasing rapidly since the end of the war. In June, 1921, the output of the British Columbia Electric system for all purposes—light, power, and street railway—was 17,578,600 kWh, whereas in June, 1922, it had risen to 21,260,700 kWh. In 1914 it delivered to its power and light customers on the mainland 64,129,692 kWh, compared with 113,909,973 kWh in 1921. In the same period the horse-power of motors connected rose from 29,562 to 54,553.—*Times Trade Supplement.*

Ontario.—The *Electrical News* (Toronto) reports that the Hydro-Electric Power Commission has acquired a lease of the power rights on the Trent Valley waterways from the Dominion Government. The annual rental is $24,000 for a minimum of 6,000 and a maximum of 12,000 h.p. The Commission has made important reductions in its rates, affecting 67 municipalities. On the other hand, increases have been made in the case of 46 municipalities. A great encouragement to the domestic use of electricity has been given by a reduction of the maximum rate for this type of supply from 4 cents to 2 cents per kWh; this applies to the whole province.

Castleblaney.—Withdrawal of Wayleave.—The Urban Council was recently informed, with regard to the electric lighting contract, that Mr. McQuillan could not discharge the terms imposed, and asked for the time to be extended to the winter of 1923. The Council thereupon decided to withdraw the wayleave granted to Mr. McQuillan.

Ceylon.—Electricity Supply Schemes.—The Municipality of the seaport of Galle, which is still lighted by oil lamps, has decided to have an electric-lighting scheme prepared, and similar schemes have recently been spoken of in connection with Kalutara, Panudara, Moratuwa, and Kurunegala.

Mr. J. G. Fraser, the Government Agent of the Western Province, is studying the questions of lighting small towns and groups of villages with electricity, and also of supplying them with water by the aid of electric energy generated by windmills combined with auxiliary motors to tide over the calm periods. As a preliminary venture he has put in an installation at Gampaha, a group of five villages some fifteen miles from Colombo. The dynamo is driven by a 7½-h.p. oil engine, and a charge of Rs.1 per month is made for each lamp installed.—*Times Trade Supplement.*

Chelmsford.—Electricity Supply.—The Rural Council has decided to offer no objection to the application of the Wickford and District Electricity Supply Co., Ltd., to supply a portion of the parish of Runwell with electricity, provided the wires are placed in approved positions.

China.—Electrical Developments.—The third power-house of the Fushun Collieries (owned and operated by the South Manchuria Railway), work on which was started in 1920, has just been completed at a cost of 1,585,000 dollars. Previous to the installation of the new power plant, the collieries had a generating capacity of 17,000 kW which was almost wholly taken up. The new plant has a capacity of 12,500 kW, making the total almost 30,000 kW. The electricity section of the collieries is now prepared to supply Mukden with cheap power in practically any quantity.—*Reuter's Trade Service* (Washington).

Shanghai.—The 1921-22 report of the engineer-in-chief of the municipal electricity undertaking states that the gross profit was Tls. 1,863,610 and the net profit, after provision for interest on loans, depreciation &c., was Tls. 1,047,608; the estimated net profit was Tls. 1,029,816. From 1916 to the end of 1921 a sum of Tls. 2,170,000 has been handed to the Council's general funds out of electricity profits. The past year has, in every way, been a record one, both as regards the profit made on invested capital and the number of kilowatt-hours sold; Shanghai sold very nearly as much electricity as the Manchester electricity department. Although the Riverside power station is not yet working under ideal conditions, nevertheless very great improvements have been effected, and the thermal efficiency of the plant has been improved to a very appreciable extent. The generating plant at this station has been increased by 46,000 kW. On March 15th the first of the two 18,000-kW turbine sets was commissioned; the second was commissioned on August 11th; on November 12th a 10,000-kW turbine was put into service, and by the end of the year the installed plant capacity at Riverside totalled 79,000 kW. When the two additional 20,000-kW turbines are ready for service, together with the two 3,000-kW machines for providing an independent supply of electricity for operating the auxiliary plant in the power house, it will be possible to dispense with two of the smaller machines, which are each of 2,000-kW capacity, and when this is accomplished the plant capacity will amount to 121,000 kW. It should then be possible to close the old Fearon Road generating station, which contained, at the end of the year, 5,600 kW of plant. During the period under review the amount of overhead cable erected reached a total of 167.64 miles, and 65.57 miles of underground cable was laid. All this work was carried out entirely by the department's staff.

Continental.—France.—As a result of proposals placed before the French Cabinet by the Ministers of Finance and Agriculture, these two ministers have been authorised to prepare a Bill to settle the conditions under which loans can be advanced by the State, under the guarantee of the Departments, to groups of towns, agricultural companies of collective interest, or to the National Office of Agricultural Credit, in connection with the establishment and working of rural electricity supply networks.

Norway.—The power station of Kristianssand municipal authorities at Nomeland has now been brought into full operation with three 7,500-h.p. turbo-generator sets. The commencement of the hydro-electric works was made in 1916 and the expenditure has been 10,600,000 kronen.

Folkestone.—Extension of Supply.—The Minister of Transport has confirmed a Special Order made by the Electricity Commissioners, empowering the Folkestone Electricity Supply Co., Ltd., to lay mains and supply electricity in the Cheriton, Saltwood, Newington, and Hawkinge districts.

Glasgow.—"All-Electric" Houses.—At a recent meeting of the Corporation Electricity Committee, the chairman referred to the success which had attended the recent demonstration of the "all-electric" system of heating, lighting, &c., in the houses at Riddrie, and, after discussion, it was agreed that the Special Committee on Housing and General Town Improvement be asked to allow two of the five-apartment type of house at Mosspark to be similarly equipped by the Department, for the purpose of further demonstration of the "all-electric" system.

Hospital Lighting.—Among schemes of work which may be put in hand by the Corporation for the relief of unemployment is electric lighting work at Belvidere Hospital, estimated to cost £7,600.

Proposed Multi-part Tariff.—A sub-committee of the Corporation Electricity Committee is considering the institution of a "multi-part" or a "two-part" system as a means of developing the sale of electricity for domestic purposes.

Visit to Gennevilliers.—A deputation from the Town Council, including Mr. Mitchell, the electrical engineer, is to visit the Gennevilliers undertaking.

Hastings.—Year's Working.—The accounts of the municipal Electricity Department (engineer: Mr. Russell F. Ferguson) for the year ended March 31st last show a total revenue of £49,468, comparing with £42,309 in the previous year. Working expenditure amounted to £33,216, as against £34,277, giving a gross profit of £16,252 (£8,032). Capital charges and bad debts were higher, totalling £11,889, as compared with £8,279, and the net result was a profit of

£4,363, comparing favourably with a deficit of £247 in 1920 21. The amount of energy sold rose from 1,521,697 to 1,745,127, and the number of consumers from 3,541 to 4,005. A total of £27,293 was spent during the year on capital account; this included instalments on new plant, £9,383; transformers, £7,805; mains and services, £5,375; and buildings, £2,929.

Lampeter.—Proposed Electricity Order.—At a meeting of the Town Council on August 22nd, Mr. William Jones asked for the consent of the Corporation to his application for an electric lighting Order. The matter was referred to a committee for consideration.

Leek.—Loan.—At a recent meeting of the Urban Council it was decided to borrow the sum of £15,000 to carry out extensions at the electricity works.

Leith.—Electric Cranes in Docks.—The Dock Commissioners are to erect additional electric cranes at the Victoria Dock.

London.—Islington.—The Borough Council has received the permission of the Electricity Commissioners to borrow £28,000 for new plant.

Lydney.—Supply Scheme Work.—Last week operations were commenced by a London construction company upon the large electric power station which it is proposed to provide near Norchard Colliery, Lydney, Forest of Dean, in connection with the syndicate which is to supply electricity throughout Gloucestershire. On Friday evening, however, the whole of the men engaged upon the work were paid off, and inquiries revealed that some misunderstanding had arisen between the syndicate and the colliery company. It is understood that this interruption in the progress of the work is not likely to continue long.

Marlborough.—Proposed Electricity Supply.—It is stated that the local gas company has under consideration a scheme for supplying electricity to the town.

Northern Ireland.—Development of Bann.—Steps are being taken to promote a Bill for the development of power from the River Bann in the "Northern" Parliament in the coming session, and the requisite surveys and plans in preparation for this important undertaking are already well in hand. Dr. J. F. Crowley, the well-known authority on water power and electricity, was recently in Belfast in conference on the matter. Dr. Crowley was a member of the Board of Trade Committees on Electricity Supply and Water Power Resources.—*Irish Independent.*

Retford.—Proposed Electricity Supply.—A report is to be prepared as to the possibility of the provision of a municipal electricity supply in conjunction with the Gas Department.

South Africa.—Electricity Act.—The Electricity Act, 1922, which was outlined in our last issue, becomes operative to-day (September 1st), says the *Financial News.*

Johannesburg.—The Corporation Electricity Department has erected a large sub-station in the central part of the city for the accommodation of four converting sets with a total capacity of 6,500 kW, to meet the growing demand for supply. Some of the plant has been transferred from the central power station, which was in a congested state.

South Shields.—Year's Working.—The Corporation Electricity Committee reports a successful year. After meeting all charges there is a surplus of £15,000 to dispose of. The reserve fund, which has been considerably depleted, will receive £5,000, and £3,000 will be placed to a special reserve fund, whilst £5,000 will be asked for to carry out necessary extensions to buildings. The reduced charges recently decided on are expected to mean a drop in revenue for the current year of some £10,000.

Stirling.—Extensions.—The Town Council has decided to extend its electricity works at a cost of £5,700, as an alternative to taking a bulk supply from the Scottish Central Electric Power Co., or linking up with the Alloa undertaking.

Thanet.—Electricity Scheme.—A scheme for the electrification of Westgate and Birchington was considered at a joint meeting of the two parish councils held at Birchington on August 23rd. Councillor J. A. Forde, of Broadstairs, manager and engineer of the Isle of Thanet Electric Lighting and Tramway Co., Ltd., attended, and explained the outline of the proposed scheme of supply by overhead wires to Westgate and Birchington. The idea, he said, was to form a subsidiary company to the Isle of Thanet Electric Lighting Co., Ltd., and to supply that company with electricity in bulk from the parent body. The Councils agreed that in principle the scheme would be desirable.

United States.—Long-distance Transmission.—The Californian-Oregon Power Co. is erecting a 110,000-V transmission line from its Prospect hydro-electric works to the Springfield sub-station of the Mountain States Power Co.—a distance of 115 miles. By this arrangement a "block" of 12,000-kW is to be transmitted for distribution among the Mountain States Co.'s consumers. The line will consists of size 00 bare copper in 350-ft. spans, mounted on suspension-type insulators.

TRAMWAY AND RAILWAY NOTES.

Ashton-under-Lyne.—A Long-distance Scheme.—Mr. Charles I. Baker, who recently left Blackpool (where he was traffic superintendent) to take over the managership, has introduced a novel scheme in the Ashton tramways. With the co-operation of the Oldham and Stalybridge authorities he has evolved a circular tour covering the three tramway systems, enabling passengers to travel the whole 12 miles with any break they desire for 1s. The tour covers several townships.

Australia.—Melbourne.—The Melbourne and Metropolitan Tramways Board has submitted to the Minister for Public Works a scheme for the construction of lines linking up Essendon and Coburg with the city. The estimated capital expenditure involved, including rolling stock, plant, and buildings, is £270,000.

Barrow.—Inquiry.—An inquiry was conducted *in camera* on August 24th by the Tramways Committee into the management and administration of the undertaking, which has been the subject of a great deal of hostile criticism by the Town Council. Since the Corporation took over the electric tramways from the British Electric Traction Co., a heavy loss has resulted to the town. A great deal of up-hill work, however, has had to be undertaken, as the whole of the cars fell into a bad state of repair during the war, and since then many new cars have been bought and other improvements have been carried out including the erection of a new large shed at the depôt.

Bolton.—Sliding Scale.—At a recent meeting of Bolton Trades Council it was decided to memorialise the Corporation Tramways Committee not to support the movement on foot in the country for tramway authorities to interfere with the sliding-scale system of regulating wages.

Burnley.—Deficit.—There was a net loss of £2,313 on the working of the tramway undertaking for the past year.

Chile.—Railway Electrification.—The Nitrate Railways Co., Ltd., the British corporation operating the principal railway system of the Province of Tarapaca, is planning to go ahead with the electrification of the Iquique-La Carpas section—a stretch of about 17 miles with heavy grades. The proposed work was covered by a contract made between the Nitrate Railway Co. and the Chilean Government in July, 1921. Although this contract has been declared void by the Chilean Congress, representatives of the State Railway say that so far as the company is concerned the contract is in full force and effect. The preliminary estimate of the cost of the work is £2,000,000, and an engineer has arrived from England to work up the necessary technical data for the preparation of detailed plans.—*Journal of Electricity and Western Industry.*

Continental.—Italy.—A concise statement upon the present and future position of electrification of the State Railways by the U.S. Assistant Trade Commissioner, at Rome, was recently published in *Commerce Reports.* It is shown that the total length of the State Railways is 15,908 km. At present the electrified portion amounts to 683 km., mostly in the Genoa, Lecco, Milan, Savona, and Turin districts. A further length of 87 km. is almost completed. As regards the future, the position is as follows:—Lines for which electrification has been authorised by ministerial decree have a total length of 2,695 km. Surveys and plans are well advanced in connection with a further 352 km. 593 km. of line is to be completed by 1926, and plans are under consideration for another 706 km. to be converted by 1926. Thus the total electrified length in that year will be 5,116 km. The lines with the greatest traffic density have been selected, the figures for these being 360 metric tons per km., as against 80 in the case of those lines not yet down for electrification. Ninety-six locomotives have been ordered from several Italian firms for delivery by October 31st next. These range in price from 1,150,000 to 1,550,000 lire.

London.—Piccadilly Railway Extension.—The London Electric Railway Co. is shortly placing contracts for the extension of the "Piccadilly" tube from Hammersmith to Ravenscourt Park, where it will join the Metropolitan District Railway and the almost disused London and South-Western line. From Ravenscourt Park to Turnham Green the London and South-Western track is to be electrified. The main object of the new construction is to relieve the Metropolitan District line from some of the heavy Richmond traffic. It will provide a through route from Finsbury Park to Richmond (13¾ miles) and Hounslow (16¾ miles).

Manchester.—Reconstruction.—During the early part of the week the busy junction where Market Street intersects Cross Street was closed to all vehicular traffic while reconstructional work was carried out. The worn track and crossings are to be renewed and the line along Cross Street straightened out—an improvement permitted by the widening due to the construction of the new Royal Exchange.

Nottingham.—Proposed New Route.—A sub-committee of the Tramways Committee recently considered the question of running a tramway service to Beeston; it eventually decided to refer the matter to a meeting of the main committee.

Southport.—Year's Working.—The annual report on the tramways for the past year shows a gross profit of £27,701, which is £3,012 more than in the previous year. Traffic receipts dropped from £80,389 to £78,293, but working expenses were also less, *viz.*, £51,242, as against £56,310. Of the gross profit, interest on loans absorbed £9,355, sinking fund £6,017, renewals fund £6,628, income tax £3,800, and £1,900 was taken to wipe out the previous year's deficit. The number of car miles run fell from 838,492 to 812,420.

TELEGRAPH AND TELEPHONE NOTES.

Argentina.—Cable Monopoly Renounced.—The American State Department has received advice that the Argentine Government has accepted the renunciation by the Western Telegraph Co. of its monopoly rights in Argentina. It is explained that the effect of the Argentine Government's action will be to open up South America to the All-America Western and Western Union Companies, with equal privileges in all the South and Central American Republics.—*Financial Times.*

France.—New Telephone Invention.—M. Sinturel, a French postal official, has invented a new apparatus by which he claims that six or even eight telephone conversations can be conducted simultaneously on one wire. He claims that no alteration in the existing circuits is necessary, and calls his apparatus the "telemultiphone." During the war he was head of the wireless service at General Headquarters.—*Reuter* (Paris).

Wireless Telegraph Congress.—The Congress of French Wireless Telegraphy, which opened last week at the Marseilles Colonial Exhibition, will furnish an opportunity for concerting measures to bring France and her colonies, and the colonies among themselves, into regular and rapid communication by wireless. While much has been accomplished much remains to be done if the French are finally to free themselves from their dependence on foreign submarine cables.—*The Times.*

Forest Fires.—Devastating forest fires have started on the Vaufreges Hills, many telegraph poles have been burned down, and communication has been cut between Marseilles and Laciotat.—*Reuter* (Marseilles).

Ireland.—Cable Station Freed.—It is officially announced that the Irregulars have been driven from Waterville cable station, in Kerry, and that a guard of National troops is now stationed there. The damage done to the cables is being repaired.—*Westminster Gazette.*

More Telegraph Lines Cut.—The telegraph wires between Mullingar and Athlone were cut on August 24th.—*Evening News.*

An official bulletin issued by the Publicity Department of the South-Western Command, Limerick, on August 24th, records that a boat arrived in Valentia Harbour, and the occupants, who were Irregulars, proceeded to cut the trans-atlantic cables. They had succeeded in severing one when troops arrived, and the cable cutters departed.—*Daily News.*

Wireless Telegraphy.—Broadcasting.—The articles of association of the proposed British Wireless Broadcasting Co. have been submitted for the approval of the Postmaster-General. Mr. Kellaway is on holiday, and it was stated at the General Post Office last week that after the permanent officials had examined the articles it might be necessary to forward them to him. In the circumstances it was impossible to name a date for the inauguration of the scheme.—*The Times.*

Police Apparatus.—A large van containing the first travelling wireless receiving station of the Metropolitan Police drove into the courtyard at Scotland Yard on August 24th, and a number of detectives listened-in to a concert which was going on at Marconi House. Travelling wireless stations will, it is expected, play a great part in the detection of crime in the future.—*Daily Mail.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Melbourne.—Victorian Electricity Commissioners. January 15th, 1923. Four water-tube boilers, each 4,500 sq. ft., with pumps, piping and structural steelwork for boiler-house.

January 23rd. Back-pressure steam turbine, including a 1,500-kW turbo-alternator.

October 17th. Postmaster-General's Department. Automatic c.b. telephone equipment, together with all associated equipment, including apparatus for use at subscribers' premises (August 18th.)

Victorian Railways. November 29th. Three electric storage-battery industrial trucks capable of carrying 4,000 lb. at five miles an hour.

Sydney.—October 23rd. Municipal Council. Two thousand 240-V d.c. and 25,000 240-V single-phase electricity meters.—*Reuter's Trade Service* (Sydney).

Belfast. — September 11th. Electricity Department. Stores (including wires, cable, lamps, electrical accessories, &c.) for six months. (August 25th.)

Belgium.—Brussels.—September 31st. Municipal authorities. Installation of a number of new boilers at the central electricity station. Particulars (10 fr.) from 11, Rue Sainte Catherine, Brussels.

September 20th. Municipal authorities of Coursol (Province of Limburg). Establishment of a l.p. distribution system in the town.

Belgian Congo.—January 5th, 1923. Belgian Ministry of the Colonies. Installation of an electrical distribution system for the town of Elizabethville. Further to our note on page 200, Elec. Rev., August 11th, a copy of the general condition of tender in French can be consulted at the Department of Overseas Trade (Room 49).*

Blackpool.—September 7th. Health Committee. Electric wiring of abattoirs. Specification, &c., from the Electricity Works Offices, West Caroline Street, Blackpool.

Brazil.—S. Luis do Maranhao.—November 27th. Municipal Council. Concession for an electric light, power, and traction supply and an electric tramway system, the concession to run for 30 years.*

Brentford.—September 25th. Board of Guardians. Six months' supply electric lamps and accessories. Mr. F. E. Harmsworth, clerk, 24, Twickenham Road, Isleworth.

Brighton.—September 18th. Electricity Department. Two water-tube boilers, superheater, economiser, steel chimneys, fans, feed pumps, steam pipes, valves, &c. (August 18th.)

Chile.—September 14th. Chilean State Railways. Electrical plant for the San Rosendo station. Departmento de Materiales y Almacenes, Alameda station, Santiago, Chile. Representative of the Chilean Railways at Paris, M. Bertrand, Boulevard St. Michel 33, Paris.*

Egypt.—Cairo.—September 11th. Ministry of Public Works. Installation of switchboard and system of armoured feeders for works of the Palais de Ras el Tine, Alexandria. Chief electrical engineer, Electrical Service, Ministry of Public Works, Cairo.—*Reuter's Trade Service* (Cairo).

Holmfirth. — September 7th. Electricity Department. E.h.p. switchgear, l.p. switchgear, transformers, underground cables, and feeder pillars. (August 25th.)

Llanfyllin.—The Town Council has decided to ask for tenders for installing electric lighting in the town hall.

London.—Hammersmith.—September 7th. Electricity Department. Transformers, oil-cooled and air-cooled; e.h.p. cables; e.h.p. and h.p. switchgear. (August 18th.)

County of London Electric Supply Co.—October 18th. Supply and erection of steam turbo-alternators for the Barking power station. (August 25th.)

Edmonton.—September 14th. Board of Guardians. Six months' supply of electric lamps. Mr. E. Ridley, clerk, 77, Bridport Road, Edmonton, N.18.

Bermondsey, S.E.—September 14th. Board of Guardians. Six months' supply of electric lamps. Mr. H. H. Reeve, clerk, 283, Tooley Street, S.E.

Westminster.—September 13th. Board of Guardians. Supply of electric lamps, fittings, &c. Mr. W. J. Lickley, clerk to the Guardians, Princes Row, Buckingham Palace Road, S.W.

Manchester.—September 9th. Waterworks Committee. One electrically-driven air compressor. (August 25th.)

September 12th. Tramways Committee. Steel girder tramway rails; general stores. Mr. H. Mattinson, general manager, Corporation Tramways, 55, Piccadilly, Manchester.

Merthyr Tydfil.—September 5th. Board of Guardians. Electrical fittings for six months. Mr. F. T. James, clerk, High Street.

New Zealand.—Auckland.—February 1st, 1923. Harbour Board. Twenty-two electric cranes for Princes Wharf.

Wellington.—October 24th. Public Works Department. 400 miles 19/13 S.W.G. bare h.d. copper wire for Mangahao electric power scheme.*

Small electrical installation for a municipal corporation, consisting of one 50-h.p. and two 100-h.p. sets, to be run separately or together. System 3-phase a.c., at 2,300 or 2,500 volts, to be broken down to 230 volts and 400 volts. The engine to be driven by crude oil or producer gas. Quotations for complete plant, including transformer equipment and switchboard, to Messrs. Wm. Coward & Co., Ltd., 22, Buckingham Gate, S.W.1.

Plymouth.—September 12th. Electricity Department. Steam turbine-driven rotary boiler-feed pump. (August 25th.)

South Africa. — October 18th. High Commissioner. Electrification of the South African railways, Maritzburg-Glencoe power house. Equipment: Coal-handling plant, ash-handling plant, and circulating-water screening plant. Specifications from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, W.C.2.

Bloemfontein. — September 20th. Municipal Council. 1,200 yd. of 4-core, .2 sq. in., 660-V paper-insulated armoured cable.

Pretoria.—September 28th. Municipal Council. Electric capstans. coal elevator, ash elevator, and coal-stacking elevator.*

Johannesburg. — September 27th. Municipal Council. House service meters and time switches.*

St. Annes-on-Sea.—Electricity Department. 3,530 yd. .5 x .5 x .25 l.p. 3-core armoured cable; 1,460 yd. 7/22 l.p. ditto; 500 yd. .2 x .2 x .1 l.p. ditto. (August 18th.)

*A copy of the plan, specification, and conditions of tender, &c., can be inspected at the Department of Overseas Trade (Room 84), 35, Old Queen Street, S.W.1.

CLOSED.

Glasgow.—The Corporation has decided by two votes to accept the offer of the United States Steel Products Co. for the supply of rails for special tramway track work amounting to £15,325. Messrs. Hadfields, Ltd., Sheffield, quoted £18,962.

Tramways Committee. Recommended:—

Traction telephones.—M. Breingan.
Brass tubing.—Earle, Bourne & Co., Ltd.

Huddersfield.—For electrician's work in connection with conversion of warehouse and offices, Northumberland Street, into kinema theatre, the tender of Messrs. J. W. & R. Graham, Huddersfield, has been accepted.

FORTHCOMING EVENTS.

International Radio and Wireless Exhibition and Conference.—September 2nd to 8th. At the Central Hall, Westminster.

Iron and Steel Institute.—Annual meeting. Tuesday and Wednesday, September 5th and 6th. At the Museum of the Yorkshire Philosophical Society, York. Commencing each day at 10 a.m.

British Association for the Advancement of Science.—September 6th to September 13th. At Hull. Annual meeting.

The Nations' Food Exhibition.—Olympia. September 6th to 26th.

THE "ELECTRICAL REVIEW" SERVICE DEPARTMENT.

To enable us to complete replies to inquiries received this week we need the names of suppliers or manufacturers of:—

Brevard electric lighting sets.

NOTES.

Amateurs' Wireless Masts.—Steel masts, instead of wooden masts, which are difficult to obtain, and often unsatisfactory, are recommended by *Steel Structures* for use in connection with amateurs' wireless installations. A simple tubular mast 30 ft. or 40 ft. high is usually suitable. This type is built up of several lengths of galvanised solid-drawn tube, each length being slightly less in diameter than the one immediately below it. A cross-bar may be inserted in the upper end to provide a ready means of attaching the span wires, and rings secured around one of the sockets permit of the easy attachment of guy ropes. For larger installations lattice girder masts are available, and are as easily erected.

Association of Engineers-in-Charge.—Prof. H. S. Hele-Shaw, D.Sc., LL.D., F.R.S., has consented to succeed Capt. H. Riall Sankey, C.B., C.B.E., R.E. (retired), as President of the Association for the 1922-23 session. This is the second time the professor has been President of the Association, he having occupied the chair in 1912-13. The Presidential Address will be delivered in October.

The Electric Vehicle Committee.—A meeting of the Electric Vehicle Committee of Great Britain was held at the Institution of Electrical Engineers on July 13th, when Mr. F. Ayton occupied the chair, and the first business taken was the election of officers of the Committee. Mr. Ayton recalled the fact that when he resigned the hon. secretaryship on his leaving municipal service he had agreed at the unanimous wish of the Committee to remain chairman of the Committee until the end of the official year. He felt obliged to adhere to his decision to retire from the chairmanship partly on account of the great pressure of other duties.

Mr. J. A. Priestley (cleansing superintendent of the Sheffield Corporation) was then elected chairman of the Committee; Mr. W. H. L. Watson (Electricars, Ltd.) was elected senior vice-chairman; and Mr. W. Worby Beaumont, junior vice-chairman. Mr. E. E. Hoadley was re-elected hon. secretary; and Mr. John Christie, hon. treasurer. The report of the publishers of *The Electric Vehicle* recorded continued progress, and a letter was read from the Society of Motor Manufacturers and Traders stating that Col. Newton had been elected a representative of the Society on the Electric Vehicle Committee in place of Mr. Hixson. Mr. P. Still (Chelsea Electricity Supply Co.) has resigned as representative of the electricity supply companies in London, and no other name was put forward. The report of the Publicity Committee, consisting of Mr. J. W. Beauchamp, Mr. W. Alderson Smith, and Mr. E. E. Hoadley, was approved. A scheme of newspaper advertising in connection with electric vehicles will be carried out, and proposals will shortly be announced for a prize competition in the design of a poster for electric vehicles. The hon. secretary reported the result of the invitation recently issued to electricity supply authorities, manufacturers, and others, in connection with subscriptions to the Electric Vehicle Committee. The Institute of Cleansing Superintendents has appointed Mr. J. A. Priestley, and Mr. J. E. Everitt (cleansing superintendent, Hampstead), to represent it on the Electric Vehicle Committee.

Mr. Makower reported that the electric vehicle section of the Society of Motor Manufacturers and Traders was considering the production of a standard illuminated sign indicating the position of electric vehicle charging stations.—*Electric Vehicle.*

Fatalities.—A locomotive fireman named Harry Hartley died at Manchester on August 22nd, as the result of an electric shock. He was attending to an engine at Victoria Station and upon alighting from it, his foot came in contact with the wooden guard of an electric rail. Rain during the day had soaked this, making it conductive, and Hartley in this way received a shock at 1,200 V. An engine driver removed him from the rail, but upon the way to Roby Street Hospital the man succumbed.

By accidentally cutting an electric cable when engaged at a fire at Grimsby, Fireman James Troop was seriously injured, says the *Daily Mail*.

A London resident, Mr. J. A. Chappell, was injured on August 26th by a lift accident at Ilfracombe, and succumbed on the following day. His wife had entered the electric lift of the hotel at which they were staying and as Mr. Chappell was entering, the lift commenced to ascend and he was caught between the lift floor and the wall. It is presumed that Mrs. Chappell must have accidentally moved the starting lever.

On August 27th an early-morning electric train running from Queen's Road to Clapham Junction on the London and South-Western Railway ran into a group of platelayers. One William Rushby, of Croydon, was killed, and two others, Charles Wingate and William Gore, were slightly injured.

Sheriff Orr and a jury, on August 24th, conducted an inquiry at Edinburgh regarding the death of a baker in a bakehouse. At the time of the fatality it was stated that death was due to suffocation from fumes given off by an electric cable which had fused in the street. With the fusing of the cable the insulating material caught fire and was supposed to have given off heavy fumes which, it was stated, found their way into the bakehouse. An official of the Corporation Electricity Department stated that the cable in question was laid in November, 1902. The insulating material which had apparently given off the fumes was composed of vulcanised bitumen, but that method was discarded 18 years ago, and lead-sheathed cables were now being used.

Educational. — Polytechnic, Regent Street.—*Electrical Engineering Department.*—The 1922-23 session opens on September 19th for day courses; evening classes commence on September 25th. Enrolments for evening classes commence September 13th.

Lectures on Costing.—A special course of lectures on costing will be delivered by Mr. R. G. Legge on Fridays at the Polytechnic, Regent Street, W., commencing September 29th. (For full particulars see our advertising pages to-day.)

Institute of Metals.—A notable feature of the forthcoming Swansea meeting of the Institute will be the inauguration of a series of annual public lectures on subjects of practical interest to those engaged in the non-ferrous metals industry.

Dr. R. S. Hutton, a member of council and director of the British Non-Ferrous Metals Research Association, is to deliver the first of the new lectures, this being entitled "The Science of Human Effort (Motion Study and Vocational Training)." The lecture will be given on September 19th. Tickets can be obtained from Mr. G. Shaw Scott, 36, Victoria Street, London, S.W.1.

Proposed Institution of Structural Engineers.—*Steel Structures*, the quarterly journal of the Steel Structural Section of the British Engineers' Association, states that a movement is afoot to form a non-trading technical institution to cater for the interests of constructional engineers. Mr. Douglas Young, consulting engineer, of 6, Queen Anne's Gate, S.W.1, is in charge of the project, and it is reported that Mr. E. Fiander Etchells, the present president of the Concrete Institute, has been invited to act as the first president.

Institution of Engineers (India).—The April *Journal* of the Institution is a bulky volume of 161 pp., supplemented by a large number of plates. The papers reprinted include "Hydro-Electric Power in Mysore," by S. G. Forbes. The second annual general meeting is reported in full. At this the report for the year ended August 31st, 1921, was presented. The report records an increase in membership to 567, and the accounts show an excess of receipts over expenditure of 27,078 rupees. The presidential address of Major G. H. Willis gave a concise review of the position of the Institution. He showed that the co-operation of the Institution had been invited in several matters, as, for instance, the revision of the standard specification for steel rails, the drawing-up of a standard specification for Portland cement for India, and the work of formulating engineering standards for India formerly carried on by the Electro-Technical Commission. He pointed out that membership of the Institution was already regarded as a testimonial to qualifications, and a rigid standard was being maintained.

Fire.—The whole of the huge switchboard in the power house at the Barrow Iron & Steel Works was completely destroyed by fire, believed to be the result of a short circuit, on August 25th, and practically the whole of the works were brought to a standstill, including two blast furnaces, the rail mills, the Siemens furnaces, and the foundries. Temporary arrangements were made with the Corporation for supplying the motive power, and the works were again in operation on the same scale as before the fire on Monday of this week.

X-ray Martyrs.—Two cases of severe injuries caused by X-rays have been reported in the course of the last few days. In both cases the victims have had to suffer the loss of an arm. The two gentlemen who have made this sacrifice for the advancement of X-ray science are Prof. Bergonié of the Faculty of Medecine, Bordeaux University, who has already suffered the removal of several fingers, and Dr. Reiss, of the Medical School, Metz.

Americans Study European Transport. — Twenty-five aldermen of the Chicago City Council recently toured the principal cities of Europe, including London, Paris, Berlin, Hamburg, Vienna, Prague, and Munich, to study transport conditions and systems. Their main object was to investigate the working of municipal ownership as against company ownership, and the leader of the party expressed himself as being in favour of the former.

Ignition of Coal Dust by Arcing.—The *Colliery Guardian* states that in America the extensive use of pulverised coal for fuel in industrial plant has brought to the front again the question whether coal dust can be ignited by an electric arc. Messrs. L. C. Ilsley and E. J. Gleim review the work done by Thornton and Bowden with electrical flashes in coal dust, and report two preliminary investigations conducted by the United States Bureau of Mines.

In the first series of tests, the source of potential was a 200-kW direct-current generator connected in series electrically with another generator of a booster set, so that any desired voltage up to 750 volts could be obtained. The cloud of dust was set in motion by a blower at the bottom of a chamber (16-in. inside diameter) and passed from the chamber into a 6-in. pipe by which it was returned to the intake of the blower and thus kept in motion. The density of the cloud could be determined photometrically, according to the amount of light that penetrated it. By calibration, different densities could be approximated. When the dust was so thick in the cloud that the lamp could not be seen through it, a readily explosive mixture was attained. The electric arc was made by separating the ends of two rods in contact. The coal dust used in nearly all the tests was bituminous obtained from the Pittsburgh bed at the Bureau's experimental mine, and passed through a 70-mesh screen. The approximate analysis of this coal as received in the analytical laboratory showed 1.91 per cent. moisture, 37.03 per cent. volatile matter, 55.77 per cent. fixed carbon, and 5.29 per cent. ash. In 637 flashes only 34 ignitions were obtained. The voltage ranged from 750 down to 220 and the current from 0.25 A to 40 A. The rsults were curiously inconsistent, varying no doubt with the type of mixture and other conditions. Although 100 arcs were made with a current of .87 A at 674 V, there was not a single ignition. When 40 A at 220 V was used, there were 11 ignitions from 14 flashes.

In the second series of tests, an endeavour was made to produce conditions still nearer to those that might exist in a mine. The testing gallery apparatus consisted of a steel shell 6 ft. in diameter, in which was a trough 30 in. wide, 12 in. deep and 5 ft. long. Dust was placed in this trough and on shelves at the side, so that when a hinged door made of 2-in. plank was permitted to fall, a cloud of dust was raised and directed towards the switch blade used to draw an electric arc. Difficulty was experienced in obtaining a propagation of an explosion. After experimenting with different amounts of dust, moving the arc nearer the bottom of the gallery, and modifying the scheme for producing the cloud of dust, fairly consistent results were obtained under what may be considered practical "field" conditions.

In these tests, each trial consisted of five successive flashes, unless fewer flashes caused ignition, and out of 39 trials the number of ignitions was 17—a much higher proportion than given in the first series of tests. The voltage remained at 650 while the current varied from 0.10 A to 0.50 A. The difficulty of obtaining consistent results on a large scale lies mostly in the inability to produce a uniform dust cloud in a single test or during a series of tests. With this problem solved for a given kind of coal dust, it is believed fairly consistent results could be obtained. For samples of dust differing in constituents, it is likely a different set of results would ensue.

An Electrical Stethoscope.—A simple but very useful piece of apparatus that has been made by Mr. E. Humphries and used by him for some five years may be described as a "listening-in" apparatus for use on small d.c. supply systems. It consists of a double head gear telephone receiver and induction coil, the primary of the coil being connected in series with a radiator lamp taking a current of about 1 amp. A flexible cord is attached with an adaptor to connect up to any lampholder, thus lighting up the lamp through the primary winding. The receiver, of course, is connected across the ends of the secondary winding. Mr. Humphries, being in charge of a small generating station and supply system in Devon, has found this apparatus invaluable, and having a total of 150 h.p. in small motors on the supply system, it is possible to listen in on any part of the system and detect any unusual disturbance; any motor with bad commutation, faulty brush gear, or bad motor-starter can easily be located by the peculiar noises. Every motor has its own particular note, and one running badly can be distinctly heard above the rest. The slipping of a belt is heard easily owing to the erratic rise and fall of the current, also a motor driving a circular saw. The starting and stopping of a motor also conveys a lot of useful information to the interested listener. A single-stroke pump driven by belt was fixed up during the war about a mile away from the supply station to supply water to a war hospital. This had to be attended to by the supply company's staff and was left running all day. The pump worked at 60 strokes per minute, and any irregularity in the running was easily heard on the telephone. Many weird sounds and happenings too numerous to mention can be heard—a loud crack tells of a short circuit, and can be heard anywhere in the room. This apparatus is chiefly used at Mr. Humphries' home, which is some distance from the station, and should prove interesting to other engineers in a similar position.

The Next President of the F.B.I.—It has been reported in the daily Press that Sir Eric Geddes will probably be the next president of the Federation of British Industries, in succession to Col. Armstrong. The rumour cannot be confirmed, as the president will be elected at the annual general meeting this month, but it is stated that Sir Eric has been approached and has returned a favourable reply, and in that case there can be no doubt as to the result of the election.

Wages in the Tramway Industry.—The employers in the tramway industry have given notice to terminate the sliding-scale agreement on September 21st, and propose to reduce wages by 12s. a week in three instalments, taking effect in September, October, and November. The representatives of the employés on the National Joint Council have unanimously rejected the proposal, claiming that the existing agreement should remain in force for 12 months. The employers have offered to submit both proposals to the Industrial Court, but the employés will not agree to this, and the Transport and General Workers' Union is organising a national campaign in opposition to the reduction, commencing at Manchester on Sunday next.

Another Short-circuiting Rat.—Rats are frequently the cause of considerable trouble in electrical installations of one kind and another. An interesting example of this recently occurred in the power station of a prominent Lancashire corporation. Incidentally, it afforded an excellent tribute to the design and manufacture of G.E.C. turbo-alternators.

A certain rodent managed to cause a "dead short" on the main bus-bars by getting across the bus-bar side of the oil switch. The "short" lasted 1¼ minutes, due to the fact that the charge engineer happened to be away from the switchboard. A 3,000-kW G.E.C. turbo-alternator set was running on load at the time and far from there being any untoward happening, the voltage died down naturally and a careful inspection of the alternator subsequently revealed that no damage whatever was sustained by the machine.

"The Scientist."—A wireless invention which enables a man to watch another at a distance beyond the range of unassisted human vision is a feature of a British film drama being produced at Shepherd's Bush. It is, of course, only an "invention" for film purposes. The film story, called at present "The Scientist," has been written by Miss Alicia Ramsay, authoress of the Byron film "A Prince of Lovers." She and the producer, Capt. C. C. Calvert, have studied the technique of wireless telegraphy so that technical inaccuracies may be excluded from the film. The theory of the invention is that light reflected on sensitive cells, within the range of which is the man under surveillance, is transmitted by ether-waves to the receiving apparatus, which projects them on the screen in the form of a picture of all that the watched man is doing. Capt. Calvert is also trying to show on the screen the accidental killing of a man by a Rontgen-ray spark. The man comes in the path of the ray and the difficulty is to show the passage of the spark and its arrival at his body. To complicate matters the man is holding a revolver, and the audience must be made to understand that the ray has not been attracted by the revolver, the explosion of which after his death is an important part of the story.—*Evening News.*

Electricity in Agriculture.—According to information compiled in Stockholm from the results of an inquiry concerning the use of electricity in agricultural districts in Sweden, a supply is available and is utilised to a considerable extent. Between 1917 and 1921 the electrified areas increased from 6.4 per cent. to 38.5 per cent. of the acreage under cultivation. It is calculated that the electrified area now amounts to 61,750 acres, or 25 per cent. of the total acreage under cultivation.

Indian Contract for Vickers, Ltd.—Messrs. Vickers, Ltd., have secured an important Indian hydro-electric contract. This is related to the development of the Bari Doab Canal, Punjab, where a head of about 6 ft. is to be used to develop 1,925 h.p. Energy from this source is to be used principally for irrigation purposes, and will be transmitted to a number of pumping stations.

The development of so much power from this low head makes the undertaking of great interest to hydro-electric engineers, and it is gratifying to know that British manufacturers are able to deal with such a problem.

Appointments Vacant.—Constructional draughtsman for the Watford U.D.C. Electricity Department; junior assistants for the Installation Department, Birmingham Electricity Works. (See our advertisement pages to-day.)

OUR PERSONAL COLUMN

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Mr. CHARLES D. LIGHTFOOT has relinquished the post of chief engineer to the Crystalate Manufacturing Co., Tonbridge, which he has held for the past ten years, and has taken up the appointment of works manager to the Solidite Manufacturing Co.

Mr. J. EDWIN STORR, superintending engineer of the Construction Department of the Yorkshire Electric Power Co., Ltd., for the past eleven years, terminated his services with that company on August 31st, for the purpose of commencing in business on his own account, dealing with all classes of generation, distribution and installation work. Mr. Storr will shortly open an office in Leeds; in the meantime inquiries may be addressed to "Lindum," Street Lane, Leeds.

The Hackney Board of Guardians has increased the salary of its engineer-in-charge, Mr. F. J. W. BETHEL, from £300 to £350 per annum (with emoluments). Also, in recognition of the way in which special work, including the installation of electrical plant, has been carried out he has been granted a gratuity of £100.

The Bessemer Medal was awarded this year by the Iron and Steel Institute to Dr. KOTARO HONDA, the celebrated Japanese scientist, for his researches into the magnetic properties of iron and steel. Dr. Honda, who was born in 1870, has devoted nearly 30 years to the study of physics, and a great part of this time has been occupied by the research for which the medal was awarded. He has occupied the Chair of Physics at the Tohoku Imperial University, and was one of the founders and first president of the Iron and Steel Research Institute of Japan. Dr. Honda has a fertile pen, and the results of his studies have been given in a large number of papers and several monographs and text books. Among other honours conferred upon Dr. Honda are included the gold medals of both the Institutes of Electrical and Mechanical Engineers of Japan. In addition to his duties at the University Dr. Honda is a member of the National Research Council of Japan and of the Aeronautical Research Institute of Tokio.

Engineer Vice-Admiral SIR GEORGE GOODWIN, K.C.B., late Engineer-in-Chief of the Fleet, and Dr. JAMES COLQUHOUN IRVINE, C.B.E., F.R.S., Vice-Chancellor and Principal of St. Andrews University, have been appointed by an Order in Council to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Obituary.—C. A. HEMINGWAY.—We regret to record the death of Mr. Charles Arthur Hemingway, which took place at Teddington on August 13th. Mr. Hemingway was one of the pioneers of electrical contracting, being, in his early days, associated with Messrs. Drake & Gorham. Afterwards, with a partner, he opened under the style of Hemingway & Pritt, at Victoria Street, S.W., and at Richmond. At a later stage he joined the staff of the General Electric Co., Ltd., where his ripe experience and genial personality made him a valued employé and a respected colleague.

J. RENE BENOIT.—In the *Revue Générale de l'Electricité* an account is given of the work of M. J. René Benoît, who died on May 5th, 1922, aged 78. M. Benoît was a physicist of the first rank; trained as a medical man, he abandoned that profession in order to pursue the study that he loved. Under Jamin he carried out a classical research on the resistivity of metals, and in 1878 he became assistant to the director of the International Bureau of Weights and Measures, which had just been established. There he was in his element; he was appointed director in 1889, and held that post until 1915, when the International Committee, on his retirement, conferred on him the title of honorary director in recognition of his distinguished services.

M. Benoît developed the methods of measurement of the expansion of substances with temperature to a degree of perfection which left hardly any scope for further improvement, and carried out numerous researches in connection with the determination and comparison of the international standards of length, in which he was aided by the present director, M. Ch. Ed. Guillaume. His collaboration with Michelson in 1892 and with Fabry and Perot in 1906 resulted in increasing by 100 times the accuracy with which the wave-lengths of light were known. To electrical men the most important of his achievements were connected with the construction of mercurial standards representing the resistance of one ohm; the International Conference on Electrical Units which met at Paris in 1884 adopted the value of 106 cm. × 1 mm.^{2} at zero C., and M. Benoît was instructed by the Minister of Posts and Telegraphs to construct four mercurial standards of these dimensions; his expert knowledge of thermometry stood him in good stead, and his four standards when completed differed by less than two parts in 100,000 from the value aimed at. M. Benoît made and distributed many copies of his standards. Ten years later, at the Conference held in London, the value 106.3 cm. was adopted, and again M. Benoît was called upon to embody it in new mercury standards, for which purpose he employed the most refined methods, an accuracy of one part in a million being attributed to the mean value of the ten units that were made. He was made an honorary member of the Physical Society of London and of the Société Francaise des Electriciens, and was appointed Correspondent of the Bureau des Longitudes and of the Academy. He was an Officer of the Légion d'Honneur.

NEW COMPANIES REGISTERED.

"B. N. B." Wireless, Ltd. (183,840).—Private company. Registered August 18th. Capital, £5,000 in £1 shares (3,500 pref.). To take over the business of manufacturers of and dealers in and agents for the sale of instruments, apparatus, accessories, and materials for radio or wireless telegraphy and telephony carried on by B. Bryan, T. N. Newton, and H. D. Bloomfield at 27, Water Street, Liverpool, as "The Anglo-American Radio Co." The first directors are: B. Bryan, 34, Cairns Street, Princes Park, Liverpool, radio engineer; T. N. Newton, 1, Delta Road, Litherland, Liverpool, haulage contractor; H. D. Bloomfield, "Alderstone," Mayfield Road, Timperley, Cheshire, engineer. Registered office: 65, Renshaw Street, Liverpool.

Corwen Electric Light Co., Ltd. (183,842).—Registered August 18th. Capital, £2,000 in £1 shares. To adopt an agreement with R. V. Wynn and to carry on the business of suppliers of electricity in all its branches. The first directors are: J. W. Black, Crown Hotel, Corwen; W. McCallum, "Bodheulog," Corwen; W. J. Kington, "Iscoed," Corwen; D. Davies, "Glansewen," Corwen; M. Hughes, "Tyisa," Corwen; R. J. Jones, "Primavera," Corwen; R. W. Jones, The Stores, Corwen. Minimum cash subscription, £1,200. Qualification, £20. Remuneration (if any), as fixed by the company. Solicitors: L. Lloyd John, Corwen, N. Wales.

Standard Wireless Supplies, Ltd. (183,924).—Private company. Registered August 22nd. Capital, £5,000 in £1 shares. To carry on the business of sellers of wireless receiving sets on the hire-purchase system, &c. The subscribers (each with 400 shares) are: E. Smith, "The Grange," Strines, Cheshire, engineer; F. S. Des Barres, 330, High Street, Ponders End, Middlesex, accountant. The subscribers are to appoint the first directors. Secretary: H. O. Collyer. Registered office: 76, Finsbury Pavement, E.C.2.

Cinema Broadcasting, Ltd. (183,954).—Private company. Registered August 24th. Capital, £100 in £1 shares. To carry on the business of "broadcasting," by means of wireless or otherwise, news, theatrical, concerts, and other like performances, to manufacture and deal in broadcasting sets and to dispose of the same to kinema theatre proprietors, &c. The subscribers (each with one share) are: A. E. Jennings, 73, Ashbourne Road, Mitcham, Surrey, clerk; P. F. Hedges, "Elmswell," 27, Fairmead Avenue, Westcliff-on-Sea, clerk. The first directors are not named. Registered by Peter Thomas & Clark, 1, Bush Lane, Cannon Street, E.C.4.

Western Union Code Co., Ltd. (183,886).—Private company. Registered August 21st. Capital, £100 in £1 shares. To carry on business as agents for the sale of telegraphic codes and cable registers and similar publications, &c. The first directors are:—Mrs. Anne J. Barnes and C. M. Barnes, both of 23, Pellatt Grove, Wood Green, N. Qualification, 10 shares. Registered office: 604-5, Salisbury House, E.C.2.

Union Wireless Co., Ltd. (183,891).—Private company. Registered August 21st. Capital, £100 in £1 shares. To carry on the business of manufacturers of wireless and electrical apparatus, &c. The first directors are: C. Lazarus, 151, Hammersmith Road, W.14, accountant; V. S. Petrie, 61, Cresswell Road, East Twickenham, accountant. No qualification required. Secretary: C. Lazarus. Registered office: 26, Leather Lane, E.C.

Scott Insulated Wire Co., Ltd. (183,890).—Private company. Registered August 21st. Capital, £12,000 in £1 shares (2,000 8 per cent. cum. pref. and 10,000 ord.). To carry on the business of manufacturers of insulated, electrical, and other wires of all kinds, &c. The subscribers (each with one ordinary share) are: M. J. Morley, 77, Elm Road, New Malden, Surrey, clerk; T. W. Stroud, 60, Ashburton Avenue, Addiscombe, Surrey, clerk. The first directors are: D. H. Scott, W. E. Sander, and E. G. Oliver. Remuneration of two first-named fixed by agreement; of other directors, £100 each per annum. Registered office: 10, Arthur Street, E.C.4.

Aerophones, Ltd. (183,866).—Private company. Registered August 21st. Capital, £15,000 in 20,000 pref. shares of 10s. each and 100,000 ord. shares of 1s. each. To take over the business carried on as the Westminster Radio Co., and to adopt an agreement with F. R. Pool. The first directors are: F. R. Pool, 60, Cromwell House, Highgate, N.6, engineer (managing director); J. O. Jones, 86, Leeside Crescent, Golders Green, N.W.11, merchant. Remuneration, £100 each per annum (chairman, £150). Registered office: "Morning Post" Buildings, 346, Strand, W.C.2.

B. Hesketh, Ltd. (183,896).—Private company. Registered August 22nd. Capital, £1,000 in £1 shares. To adopt an agreement with B. Hesketh, of High Street, Chalvey, Slough, and to carry on the business of wireless engineers and contractors, manufacturers of and dealers in electric, magnetic, galvanic, and other apparatus, &c. The permanent directors are: B. Hesketh, B.Sc., High Street, Chalvey, Slough, wireless engineer; T. Hesketh, 42, Castle Hill Avenue, Folkestone, managing director for Folkestone Electricity Supply Co., Ltd.; R. H. Klein (M.I.Radio E.), 18, Crediton Hill, West End Lane, N.W., wireless engineer; H. L. McMichael (M.I. Radio E.), 32, Quex Road, West End Lane, N.W., wireless engineer. B. Hesketh is managing director and signs for 499 shares. Qualification: £1. Remuneration of managing director, £260 per annum; of others, £5 each per annum. Registered office: High Street, Chalvey, Slough, Bucks.

Acme Radio Valve Co., Ltd. (183,894).—Private company. Registered August 22nd. Capital, £100 in 1s. shares. To acquire and turn to account an invention relating to wireless telegraphy or telephony, &c. The first directors are: H. S. Tyler, 65, Upper Gloucester Place, N.W.; F. Adair, 65, Upper Gloucester Place, N.W.; E. J. Stammers, 13, Poynders Road, Clapham Park, S.W.4. Qualification: 500 shares. Remuneration as fixed by the company. Secretary: E. J. Stammers. Registered office: St. Andrew's House, 32-4, Holborn Viaduct, E.C.

Beckett & Anderson, Ltd. (12,338).—Private company. Registered in Edinburgh August 22nd. Capital, £25,000 in £1 shares (7,500 cum. part. pref. shares and 17,500 ord.). To acquire as a going concern the business of Beckett & Anderson, engineers and electricians, 59-63, Greendyke Street, Glasgow. The first directors are: F. Beckett, 31, Cauderwood Road, Rutherglen, Glasgow, electrical engineer; R. C. Anderson, 7, Kersland Street, Glasgow, engineer; J. B. Lang, Johnstone, engineer. Qualification: 250 ordinary shares. Remuneration: £600 each. Solicitors: David Inglis, 223, West George Street, Glasgow.

Elgin Electric Supply Co., Ltd. (12,343).—Registered in Edinburgh August 23rd. Capital, £15,000 in £1 shares. To generate and supply electric current for light, power, and any other purpose in or near Elgin. The subscribers (each with one share) are: J. Wittet, 81, High Street, Elgin, architect; W. Carrie, 83, High Street, Elgin, merchant; G. Geddes, Forteath Avenue, Elgin, builder and quarry master; F. A. Ritson, 78, High Street, Elgin, C.A.; J. R. Hamilton, 92, High Street, Elgin, solicitor; J. Young, 92, High Street, Elgin, solicitor; A. G. Cockburn, 92, High Street, Elgin, solicitor. Minimum cash subscription, 10,000 shares. The first directors are: J. Wittet, W. Carrie, G. Geddes, A. N. Rye, 16, Eaton House, Belsize Park Gardens, London, S.W., electrical engineer, and Edward J. Williams, 7, Queensgate, Inverness, electrical engineer. Qualification: 50 shares. Secretary: A. G. Cockburn. Registered office: 92, High Street, Elgin.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

General Wireless, Ltd.—Debenture dated July 28th, 1922, to secure £230, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. H. Burgess, 11, Clement's Inn Passage, W.C.2.

Kelvin-Hardy Electric Co., Ltd.—A. A. Whittingham-Jones, of 41, Castle Street, Liverpool, was appointed receiver on August 16th under powers contained in debenture dated May 1st, 1922.

C. G. Prewett, Ltd.—F. N. Clarke, of 4, Pavilion Buildings, Brighton, was appointed receiver on August 11th, 1922, under powers contained in debenture dated December 23rd, 1919.

C. H. Mason & Co., Ltd.—Mortgage and mortgage debenture both dated August 9th, 1922, to secure all moneys due or to become due from company to Bank of Liverpool and Martins, Ltd., not exceeding £11,500, charged on 65-73, West Street, Gateshead, and company's undertaking and other assets, including uncalled capital.

F. Geere Howard, Ltd.—Particulars of £6,250 debentures authorised August 10th, 1922, charged on the company's undertakings and property, present and future, including uncalled capital; whole amount issued.

Calcutta Tramways Co., Ltd.—Particulars filed of £250,000 second debentures authorised May 8th, and covered by trust deed dated July 25th, 1922, charged on the company's undertaking and property, present and future, including uncalled capital, subject to trust deed dated June 4th, 1901, securing £350,000 4½ per cent. first debenture stock, the whole being now issued. Trustees: Beaver Trust, Ltd. (discount and commission, 5 per cent. to subscribers and 2 per cent. underwriting commission, with an overriding commission of 1 per cent.).

General Electric Co., Ltd.—Land Registry charge on Osram-G.E.C. lamp works, Brook Green, Hammersmith, dated August 11th, 1922, supplemental to trust deed dated July 22nd, 1921, securing £3,500,000. Trustees: London City and Midland Executor and Trustee Co., Ltd., 5, Threadneedle Street, E.C.

Parmiter, Hope & Sugden, Ltd.—Mortgage dated August 15th, 1922, to secure £2,500, charged on certain land and premises in Vernon Street, Longsight, Manchester. Holders: Mrs. M. J. Ross, 45, Howard Street, Salford, and others.

Birmingham Central Supply Co., Ltd.—Particulars of £300 second debentures authorised August 12th, 1922, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital; whole amount issued.

A. W. Richardson & Son, Ltd.—Satisfaction in full on July 28th, 1922, of mortgage dated April 9th, 1919, securing all moneys due or to become due from the company to the Manchester and Liverpool District Banking Co., Ltd.

CITY NOTES.

Southern Brazil Electric Co., Ltd.

The report of this company for 1921 states that, although the net operating results showed a large increase in Brazilian currency, through the fall in exchange a loss of £39,046 was shown after allowing profit for the sale of certain investments. This, added to the debtor balance brought forward, made a total of £76,896 at debit of profit and loss.

The general meeting was held, under the chairmanship of Mr. E. H. Tootal, on August 29th. Mr. Tootal said that the capital re-organisation scheme was awaiting the Court's approval, which would no doubt be obtained soon after the Long Vacation. The anticipated rise in Brazilian exchange had not materialised owing, in part, to political troubles. An encouraging feature was the present prosperity of coffee planters, cotton-growers, and others, which was leading to many new applications for power. The services of the company and subsidiary concerns were all working satisfactorily, and there should be a gratifying increase in currency revenue during the present year.

Tyneside Tramways and Tramroads Co.—For the half-year ended June 30th, 1922, the surplus of receipts over expenses was £4,134, and the balance brought forward was £591. After deducting interest on mortgages, loans, &c., the available balance is £2,711. After paying preference dividend at the rate of 5 per cent. per annum (less income tax); a dividend on the ordinary shares at the rate of 2 per cent. per annum (less income tax); putting £500 to the credit of reserve for renewals, depreciation, and other contingencies, and writing £143 off expenses of mortgage issue, £128 remains to be carried forward. The traffic receipts show a decrease of £9,910 for the period, largely due to trade depression.

Mr. G. E. Henderson has been appointed chairman in place of the late Dr. J. T. Merz, and Mr. Norbert Merz has joined the board.

Stock Exchange Notices.—Dealings in the following have been specially allowed under Rule 148a.

September 7th. Bromley (Kent) Electric Light & Power.—90,000 shares of £1 each, fully paid, Nos. 1 to 90,000.

An official quotation has been granted to £2,500,000 six per cent. first mortgage debenture stock 1925-49 and to 1,500,000 seven and a-half per cent. cumulative preference shares of £1 each, Nos. 1 to 1,500,000, in Whitehall Electric Investments, Ltd.

The undermentioned have been ordered to be officially quoted:—

Bromley (Kent) Electric Light and Power.—90,000 shares of £1 each, fully paid (Nos. 1 to 90,000).

American Telephone and Telegraph Co.—The American Telephone and Telegraph Co. has authorised the issue of new capital stock to stockholders of record September 8th in the proportion of $100 new stock at par for every five shares of $100 each held. The company has declared regular quarterly dividends of $2.25 a share payable January 15th, April 16th, and July 16th, 1923, to stockholders of record December 20th, 1922, March 16th, 1923, and June 20th, 1923.

Companies to be Struck off the Register.—The following are to be struck off the register within three months unless cause is shown to the contrary:—

Institute of Medical Electricity, Ltd.
International Electrical and Mechanical Supplies Co., Ltd.
Pebco Accumulators, Ltd.
Simplex Power Generator Co., Ltd.
United Electrical Works, Ltd.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Interim dividends of 3½ per cent. on the 7 per cent. preference shares and 2½ per cent. on the 5 per cent. preference shares, both less tax.

Hurst, Nelson & Co., Ltd.—Dividend on ordinary shares at the rate of 2s. per share and a bonus of 1s. per share, both free of tax.

Pinchin Johnson & Co.—Interim dividend of 5 per cent. actual on ordinary shares for the half-year ended June 30th.

Pennsylvania Water and Power Co.—Dividend of 1¾ per cent. on common stock.

British Columbia Electric Railway Co.—Interim dividend of 3¼ per cent., free of tax, on preferred and deferred stocks.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.—By an order of the Chancery Court a meeting of preference and ordinary shareholders will be held at Winchester House, Old Broad Street, E.C., on September 14th, to consider, and, if thought fit, approve a scheme of arrangement proposed to be made. A copy of the proposed scheme of arrangement can be seen at the registered offices of the company.

STOCKS AND SHARES.

Tuesday Evening.

The general aspect of Stock Exchange markets is coloured by the foreign political developments. With the mark jumping about in headlong fashion day by day—it has touched extremes of 11,000 and 6,000 in less than a week—the nerves of the investor, as well as those of the speculator, are severely tried, and money tends to keep away from Stock Exchange markets. At the same time, it becomes unfortunately clear that the expectations of a trade revival that were entertained in the spring, stand little chance of fulfilment at present. Consequently, those people who had been keeping money on deposit at the banks, are beginning to despair of wanting that cash for their own businesses.

The result is that attention is being turned once more to Stock Exchange securities, and, although there are more inquiries than orders, a quiet amount of business goes on day by day in the industrial departments. Amongst the purely gilt-edged stocks, the disposition is for prices to droop. A good many financial engagements have to be met this week, more especially on the Friday, when the year's grace from the official conclusion of peace, allowed by the various Emergency Regulations, comes to an end. New issues are conspicuous by their absence. August is invariably a lean month in this respect, owing to the holiday influences at home and abroad.

The electricity supply market is firm, with rises of 5s. in Bromptons to 7¾ and half-a-crown in Westminsters to the same price. City Lights ordinary have risen to 2 1/16. London Electric preference at 5 have lost the half-a-crown they gained a week ago. It is interesting to compare the present interim dividends, declared by the leading companies, with those of a year ago; the table is as follows:—

Company.	Div. per cent. 1921.	1922.	Increase.
Brompton	9	9	—
Charing Cross	6	10	4
Chelsea	5	8	3
City	10	10	—
County	5	6	1
Kensington	8	9	1
Metropolitan	4	5	1
St. James'	7	10	3
Westminster	8	9	1

It is not to be assumed from the substantial increases that some of the companies have declared, in their present interim dividends as compared with those of a year ago, that the final dividends will be equally advanced. The companies' policy has been to bring into nearer equality the interim with the final distributions. Nevertheless, as we were mentioning just lately, pleasurable anticipations await the dividends for the year. All the above dividends are "at the rate of" the amounts placed against the companies. In other words, the actual cash paid out is one-half of the figures given.

The Newcastle-on-Tyne Electric Supply Company announces that there will be no interim dividend on the ordinary shares this time, repeating the experience of a year ago. This has had no effect upon the prices of the company's shares. In fact, the 7 per cent. preferences at 23s. are 1s. higher. Urban Electrics at 20s. are half-a-crown up. Brush ordinary remain at 25s. 6d.; English Electric preference strengthened to £1; India Rubber shares at 12s. 6d. are rather easier; Siemens hardened to 27s. 6d.; and the other movements in this group are comparatively small.

Interest in Home Railway stocks has subsided; speculation has drifted to a low ebb in this market. There came a violent rise in Districts, lifting the price to 42 before profit-takers caused a reaction to 41. This still leaves the stock 1½ higher on the week. Metropolitans have been 56 and are now back to 54. Metropolitan Surplus Lands at 55 is a point lower and Central London ordinary assented stock at 67 is similarly down. No changes have occurred in the Underground Electric Railways group. A few of the London traction shares are a trifle easier, London and Suburban preference, for instance, easing off to 9s. 6d., which is 6d. lower than they were a week ago.

The foreign tramways division is dullish, with Mexican Light & Power issues mostly easier. There is still a disappointing absence of news from Mexico, and with no fresh enterprise on the part of speculation, the natural course of prices sags. The British Columbia Electric Railway Co. declares an interim dividend of 3¾ per cent., free of tax, on its preferred and deferred stocks. These are advances in both cases of 5s. per cent. as compared with August, 1921. They make the yield on the stocks look tempting, and the deferred at 76½ paying, as it does, 8½ per cent. on the money, free of tax, is worth considering by the speculative investor not averse from taking risks in order to secure a big yield.

Movement in the cable group is confined to a rise of 5s. in Globe preference, which makes the price 11¾. Other members of the same family are holding the improvements secured last week. The American division is exceedingly quiet. Marconis have gone back to 45s., there being a noticeable lack of interest. At the moment, more attention is being paid to other industrials, and the wireless group is out of favour. Radio Corporations, after a rise to 2½s., went back to 21s. 9d., shares coming in from the United States. The preferred remain about 14s.

Babcock & Wilcox are unchanged at 2⅞. Rubber shares are heavy, owing to the price of the produce being still a trifle under 7d. per lb. The iron and steel market shows little resiliency, and armaments move with the leading shares in the former group. Amongst new issues, County ordinary hold their premium at 3s. 7½d., and the preference at 1s. 9d. are keeping very firm.

Amongst the sound debenture stocks on offer, a small amount of Yorkshire Electric Power 5½ per cent. is worth mentioning; it can be bought at 102½, with interest in April and October, and pays £5 7s. per cent. on the money. It will be redeemed at 100 in 1944 or earlier. Whitehall Electric investments 6 per cent. first mortgage debenture at 89¼ yields 6¾ per cent. This is, of course, more speculative. Melbourne Electric 6 per cent. general mortgage debenture is on offer at 102, free of stamp and fee. A small interest payment (30s. per cent.) falls due on December 1st; after that, the half-yearly interest in June and December is, of course, the full 3 per cent. British Thomson-Houston 7 per cent. mortgage debenture stock stands at 105, at which it returns 6¾ per cent. on the money. It is liable to redemption at 102½ between 1931 and 1941; or at 100 in 1962.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1920.	Dividend 1921.	Price Aug. 29. 1922.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	12	12	7⅞	+ ¼	£7 14 10
Charing Cross Ordinary	8	9	7½	—	5 17 0
do. do. do. 4½ Pref.	4½	4½	4	—	5 12 6
Chelsea	6	6	6¾	—	4 18 0
City of London	14	14	2 1/16	+ 3/16	6 15 6
do. do. 6 per cent. Pref.	6	6	23/-	—	5 4 4
County of London	8	8	1 15/16	—	5 11 4
do. do. 6 per cent. Pref.	6	6	23/-	—	5 4 4
Kensington Ordinary	9	10	7⅞	—	6 15 7
London Electric	2½	4	2⅛	—	5 11 6
do. do. 6 per cent. Pref.	6	6	5	— ⅛	5 17 1
Metropolitan	7	7	5⅝	—	6 4 5
do. 4½ per cent. Pref.	4½	4½	4	—	5 12 6
St. James' and Pall Mall	12	12	8½	—	6 17 2
South London	7	7	8½	—	8 0 0
South Metropolitan Pref.	7	7	1 15/16	—	5 18 0
Westminster Ordinary	10	10	7¾	+ ¼	6 9 0
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref	6	6	104½	—	5 14 8
do. Def.	1½	34/6	28½	—	7 9 0
Chile Telephone	6	6	6	—	5 0 0
Cuba Sub. Ord.	7	7	8½	—	8 9 8
Eastern Extension	10	10	18⅝	—	5 6 8
Eastern Tel. Ord.	10	10	186⅝	—	5 7 3
Globe Tel. and T. Ord.	10	10	19½	—	5 8 5
do. do. Pref.	6	6	11¾	+ ¼	5 2 2
Great Northern Tel.	24	22	29½	—	7 10 6
Indo-European	10	10	36	—	6 19 0
Marconi	25	15	2½	— ¼	6 18 4
Oriental Telephone Ord.	12	12	25	—	*5 1 1
United R. Plate Tel.	8	8	7	—	*5 14 4
West India and Panama	Nil	Nil	5/-	—	Nil
Western Telegraph	10	10	19	—	*5 5 8
Home Rails.					
Central London Ord. Assented	4	4	67	—1	5 19 5
Metropolitan	1½	2½	54	—	4 2 7
do District	Nil	1	41	+1½	2 8 10
Underground Electric Ordinary	Nil	Nil	2½	—	Nil
do. do. "A"	Nil	Nil	7/-	—	Nil
do. do. Income	2	4	84½	—	*4 14 7
Foreign Trams, &c.					
Anglo-Arg. Trams, First Pref.	5½	12½	91	—	7 17 2
do. do. 2nd Pref.	Nil	5½	81⅛	—	7 0 9
do. do. 5 per cent. Deb.	5	5	82	—	6 2 0
Brazil Tractions	Nil	Nil	49½	—	8 1 0
British Columbia Elec. Rly. Pce.	5	5	76½	—	6 9 9
do. do. Preferred	5	20/-	69½	—	*8 13 6
do. do. Deferred	8	12½/-	76½	—	*8 2 4
do. do. Deb.	4½	4½	76	—	5 11 0
Mexico Trams. 5 per cent. Bonds	Nil	Nil	73½	—	—
do. do. 6 per cent. Bonds	Nil	Nil	45½	—	Nil
Mexican Light Common	Nil	Nil	20¾	—2	Nil
do. Pref.	Nil	Nil	48¼	—2½	Nil
do. 1st Bonds	Nil	5	64½	+1	7 15 0
Manufacturing Companies					
Babcock & Wilcox	15	15	2⅞	—	5 11 4
British Aluminium Ord.	10	10	18/3	—	—
British Insulated Ord.	15	15	42/-	—6d.	7 2 10
Callenders	15	15	2½	+ 3/16	7 1 2
„ 6½ Pref.	6½	6½	1¾	— 1/16	5 15 7
Crompton Ord.	10	5	15/-	—	6 13 4
Edison-Swan	10	Nil	3/8	—	Nil
do. do. 5 per cent. Deb.	5	5	64	—	7 16 4
Electric Construction	10	10	1½	—	8 0 0
English Electric	8	5	17/6	—	5 14 3
do. do. Pref.	6	6	18/9	—	6 8 0
Gen. Elec. Pref.	6½	6½	22/-	—	5 18 2
do. Ord.	10	5	18/9	—	5 6 8
Henley	15	15	2½	— 3/16	6 13 4
do. 4½ Pref.	4½	4½	4¼	— 1/16	5 2 10
India-Rubber	10	—	⅜	— 1/16	—
Met.-Vickers Pref.	8	8	2½	—	6 8
Siemens Ord.	10	10	27/6	+6d.	*7 5
Telegraph Con	20	20	28	—	*4 12 5

*Dividends paid free of Income Tax.

FALSE MARKING AND DESCRIPTION OF GOODS WITH SPECIAL REFERENCE TO ORIGIN.

By THEODORE RICH.

Part V.—Actions and Decisions Under the Merchandise Marks Act.

Owing to the fact that most proceedings under the above Act take place before a Court of Summary Jurisdiction, and owing to the great expense involved, there are comparatively few decisions of the High Court of material value with reference to the wording of the Act.

There seems to be little special literature, notes and comments on the law being tucked away in various legal and popular handbooks. The most complete exposition is perhaps to be found in the minutes of evidence of the 1920 Merchandise Marks Committee spread over nearly 6,000 questions and answers.

Two trades have been specially attacked by Anglo-alien tricksters—the linen trade of Ulster and the edge-tool trade of Sheffield. Judging by the 1920 minutes, the Irish Department of Agriculture and Technical Instruction is an exception to the rule that Government Departments refuse to move. A Mr. R. A. Whyte, giving evidence, stated that he had been identified with about 80 prosecutions under the Act, apparently with general success. A material number of these, however, related to foodstuffs.

The Irish Development Association was started in 1906 to administer an Irish national trade mark and to take proceedings against persons in any part of the world detected selling or misdescribing non-Irish goods as Irish goods. This Association successfully prosecuted a trader who advertised and sold Bristol-made boots as Irish, a firm that sold shoddy as Donegal tweed, and stall-holders in an "Irish section" of an exhibition at Shepherd's Bush who sold non-Irish goods, and stopped a Liverpool firm which had only bought one hogshead of Irish tobacco from selling "Irish Home-grown Plug." The success that this Association has had shows what such an organisation can do when it tries.

One case remarkable for the very long time it took to carry through from first to last, and for the great expense involved, was "Lemy *v.* Watson" (1915, 3 K.B., page 731). The defendants had sold tinned "bristing" as sardines, and the plaintiff, representing a number of people interested in the real sardine industry in France, took the matter up; in the end the prosecution was successful, and the defendant, Angus Watson, had to give up the use of the name "sardine."

The Object of the Act.

Lord Reading put the essence of the Act into a nut-shell when he said: "The object of this statute was to protect the public against false descriptions which might be given to goods by members of the trade"; in this case the goods were called Norwegian sardines, and not Norwegian sprats, "because by that means they got a better sale for their goods, and they got a better sale because the public did not know that they were buying sprats and not sardines."

An old case, "Starey *v.* Chilworth Gunpowder Co." (24 Queen's Bench Division, page 90), is of interest. In 1888 the powder company made a contract with the Government to supply 5,000 barrels of gunpowder known as "Rifle Large Grain No. 4"; there was no stipulation in the contract that the powder should be made by the company, although in other contracts of the same firm with the Government there was an express stipulation to that effect. Two explosions prevented the company from making the powder; the company was pressed for delivery, and a sub-contract was placed in Germany, and the powder was imported in drums marked "Manufactured in Germany." The powder was repacked in Government barrels and labelled, "Chilworth Gunpowder Co." There was no indication that the powder was German, there was no difference in quality, and the company actually made a loss on each barrel; the powder was accepted by the Government without complaint.

The magistrates found that there had been no intention to defraud, and dismissed the petition. The case went to appeal, and it was pointed out that the label must have been used to convey the meaning that this company, which usually manufactured, had manufactured the powder in question. It was decided that there had been a "false trade description."

It is well known that some years before the war several well-known normally manufacturing electrical firms imported from Germany three-phase apparatus, especially induction motors, the machines being painted up and labelled with the names of the British firms; there is little doubt that the firms could have been prosecuted with success.

Foreign Components.

There have been several cases where watches containing foreign parts have been sold as "English lever," and in the case of "Williams *v.* Turney" (65 Justice of the Peace, page 70) it was decided that the fact that there were some foreign components in a watch did not oblige the Court to decide that there had been a "false trade description," though there was nothing in the law to prevent a magistrate from coming to such a conclusion in view of the nature of the imported parts and the degree of foreign labour and skill involved.

According to the evidence of Mr. Fountain, of the Board of Trade, at the 1920 inquiry, the Board has prosecuted in cases where foreign goods have been described in catalogues and advertisements as of British manufacture; details, however, were not given.

The fact that a manufacturer marks his goods with the place of origin does not necessarily protect him. In the Godfrey Phillips case (*Times*, July 24th, 1909) cigars were sold marked on the box "Bella de Cuba" and with labels on the lids "guaranteed British make." It was held that the combination of words, marks and labels which had been used "were calculated to lead to the belief that the goods were made in the island of Cuba or that the cigars were composed of Havana tobacco, and therefore there was a false trade description."

The genuinely British manufacturers and the more honest section of the commercial community have little grounds of complaint regarding the legal decisions given in the High Court regarding such matters, but they have great cause to complain regarding the delay, expense, and difficulty before they get there.

Intention to Defraud or Lower Value Not Material.

It has been held that the "use of a false description which misleads the public cannot be said to be lawful, even if there was no intention to defraud" ("Holmes *v.* Pipers," 1914, 1 K.B. 57), although the Act only punishes those who use false trade descriptions which are untrue in fact.

In the case of "Kirschemboim *v.* Salmon & Gluckstein" (1898), some machine-made cigarettes were sold under a label marked "guaranteed hand made"; the magistrate decided that the using up of a stock of old labels was not a false trade description within the meaning of the Act. The Court of Appeal, however, decided that the fact that the cigarettes were of as good a quality as those described on the label afforded no defence, the description being "false in a material respect"; the tobacconist had knowingly applied a false description and had not acted innocently, and therefore an offence had been committed. The purchaser was induced "to purchase goods which he would not have purchased if the description in question had been omitted from the label."

Public Entitled to Their Views.

Lord Russell of Killowen said that "people think that hand-made cigarettes are better than those made by machine, and they are entitled to be supplied with what they ask for and pay for . . . or, again, a person may call for hand-made cigarettes for different reasons independent of the question of quality, as, for instance, the desire to encourage and support the industry of hand workers."

Mr. Justice Hawkins said that "The materiality of the trade description cannot be made dependent on a comparison of the quality of the goods supplied to the purchaser with that of other goods."

In a case where Glauber's salts were sold as soda, "Fowler *v.* Cripps" (1906, 1 K.B.), Mr. Justice Wills said: "The Merchandise Marks Act is an Act passed not to ensure scientific accuracy in trade terms, but to protect trades and to ensure, as far as legislation can do so, that trade shall be carried on honestly, and that terms shall not be applied to substances where the application would, according to the common acceptation of those terms in the trade, lead the purchaser to assume that he was buying something different from what he really was buying."

Proposals for Alteration of the Law.

Since the original Merchandise Marks Act, many proposals have been made to alter and especially to strengthen the law. The lowest grade of merchant and huckster, those who change the labels on the goods they handle with the same nonchalance as they change their own names and nationalities, naturally object to the law as it stands. Owing to representations made some time ago, there is now nothing to prevent a merchant from bringing goods marked "British made" from abroad and shipping them to, say, a South American port, where they can be sold "*ex* steamship so-and-so from London."

Compulsory Marking.

Even in places like Sheffield the resistance to "free fraud" is weakening. If the evidence of Trade Union representatives is anything to go by, then the feeling of the working classes in this country is overwhelmingly in favour of the compulsory marking of all goods, although in evidence given in the 1920 inquiry significant sympathy for Germany was shown by some officials.

The politician proclaims from the housetops his love for the masses, but he only too often listens to the blandishments of the international merchant, who often makes much more profit than the manufacturer and often has more margins to invest in political subscriptions "on terms" than those who spend much more in labour and taxes than the middleman.

In the United States the legislators who do not seem to be afraid of any twopenny-halfpenny power that might object, have made it a rule that all goods capable of being marked without injury must be marked with the country of origin. Proposals have been made that goods coming to this country from abroad should be marked "made abroad." This is shirking the real question whether those who purchase have a right to know what they are buying, where it comes from, and which, in fact, is the firm dealt with. If the country of origin had to be indicated, then many superficially naturalised merchants and retailers with brothers and cousins in the Fatherland would howl, and the public might then realise who was making money out of the bad exchange.

The Government Bill.

Owing to the continuous complaints of the manufacturing community, the Government has drafted a Bill to amend the Merchandise Marks Act; superficially, at least, it looks as if further steps are going to be taken in the right direction, but when it is closely examined much of the gilt comes off the gingerbread. One great objection is that of extension of the system of legislation by a bureaucracy by means of "Orders," that is to say, there is to be more power for officials, who quickly find out which way their bread is buttered. A department that has lamentably failed in the past cannot be expected to do its duty, with added spragging powers, in the future; there are so many "ifs and ans"; the Bill looks too much like a bit of popular legislative camouflage for it to mean business. The means taken to delay the progress of the Bill by deliberate abstentions in Committee at the end of last July, which was too marked to be accidental, tends to show that even the proposed milk-and-water instalment might inconvenience some of those who believe in the right to deceive the buyer. The opposition to the Bill, which comes from certain quarters, is a distinct testimonial in its favour.

Goods Conveying a False Impression.

According to Part I, if the Board of Trade, after making such inquiries as it thinks necessary, is of the opinion that a false impression as to their origin is likely to arise, the Board may (not must) make an order requiring an indication of origin to be given, by means of a mark applied to the goods or otherwise, either at the time of importation or when put up for sale. By an order, goods in transit or any other special class of goods can be exempted. The representations of trade or manufacturing bodies are to be considered.

According to Section 2, the application of national or public devices likely to "lead any person to believe that the goods are goods made or produced" in the United Kingdom or in the Empire, can (not must) be prohibited by the Board of Trade unless accompanied by an indication of origin. Needless to say, those who have in the past imported goods with a deceptive device *shall* be entitled to go on doing so; the extra profits of merchants based on deception naturally come before the rights of the public that pays.

The sale or exposure of goods for sale not marked, or marked contrary to Section 3, is an offence unless the person responsible proves that he acted innocently (a nod being as good as a wink to a conveniently blind horse), or that the goods were imported before the date of the order.

Those who remember the deliberate delays over the Safeguarding of Industries Bill and the delays regarding the Reparations Bill will realise how warehouses would be stocked with offending goods pending a Board of Trade decision on such questions, and who doubts that material sums might be made with the aid of inside information.

Action in the High Court.

Section 3 seems to be a real improvement, but it apparently applies only to the contravention of the principal Act, as instead of having to wait months, if not years, while a case is being dragged out in a magistrates' Court, it can be taken direct to the High Court, but this facility is only open to any person who claims to have suffered damage or to any trade association, and, further, the permission of the Board of Trade or the Minister of Agriculture must be given before proceedings in the High Court can be commenced; but "consent shall not be withheld in any case unless the Board are of the opinion that the case is one which ought to be undertaken by the Board in pursuance of their powers under Section 2 of the Merchandise Marks Act, 1891."

This is another sample of the depriving of the public of their rights of action, except by permission of the bureaucracy. Matters might be hung up for weeks; those wishing to prosecute might experience difficulties in Government offices, like Trade Unionists who object to political contributions, and information might also leak out.

It would be much more satisfactory if the right of the individual to commence proceedings was not clogged in any way either regarding the principal Act or the amendments, and if the Board of Trade after commencement could intervene in Court with a certificate to the effect that it intended to start proceedings with regard to the same question within a given time; on such a certificate being given the private case could be adjourned.

In order to discourage frivolous prosecutions on the one side and to discourage undesirable practices which might not amount to legal fraud, the Court should be empowered, where desirable, to grant "solicitor and client" costs and to order a sum to be paid into Court as security for costs.

As the Board of Trade has for years failed to take adequate steps to promote honest trade, it is not for it to have too much of a "finger in the pie," and if a case taken by private individuals is of importance to the general public the Judge should have powers to certify it as such, and then a grant should be made out of the public purse towards expenses for having taken steps the Government failed to take.

Indications of Origin.

According to section 4, goods to which a forged trade mark or false trade description has been applied, goods made outside the United Kingdom which have the name of a British manufacturer, dealer or trader, or with a national device, not accompanied by an indication of origin, are prohibited to be imported and are liable to forfeiture.

In section 5, goods, the importation of which would be prohibited but for an indication of origin, must not have the indication removed, altered, or obliterated, and to sell such goods or possess them for any purposes of sale or manufacture will be an offence. This apparently only relates to indications required by the Act, so that if goods come into this country marked "made in Japan" or "made in Germany" there is nothing to prevent the marking being rubbed out or covered up; there are some people sufficiently reactionary to think that the obliteration of any mark of origin should be looked upon as a fraud and punished as such.

Verbal Descriptions.

There is a great improvement in Section 6 which adds the following to the end of sub-section (2) of Section 5 of the principal Act: "and in the case of a trade description, whether it is oral or consists of a statement contained in an advertisement, catalogue, or other document." This wording should go a long way towards removing difficulties frequently complained about.

Sections 9 to 11 deal with the use of Government Marks and Royal Arms.

In Section 14, under "indications of origin" in relation to any goods, the indication can either state the country in which the goods were produced or that they were produced abroad. This section is obviously inserted to please the importers of German goods.

Shirking the Issue.

If a thing is worth doing, it is worth doing well; if it is desirable to mark goods at all, they should be marked with the country of origin—if not, why not?

In Part II of these articles, the bogy of the advertisement of Germany through the "made in Germany" mark was dealt with. There is not the slightest doubt that if a referendum was taken on the subject, regarding the subject of the compulsory marking of all goods capable of being marked, as in the U.S.A., there would be an overwhelming majority. If it is right for any imported goods to be marked, then as far as practicable, they should all be marked, and no favour shown for any trade, article, or concern.

If the Bill gets passed as it is, full of departmental loopholes and orders, then there will doubtless be the same sort of state of affairs as there was during the war, when there was importation of prohibited goods under licence for approved concerns; there is a danger that "axe-grinding and log-rolling" would take place in the neighbourhood of Whitehall.

They say that "half a loaf is better than no bread," although it looks as if the bread which looks attractive in the drafted Bill may turn out to be "Pumpernickel."

Trick the People.

A democracy kept in ignorance is the most dangerous form of government for any state, and if the public realised some of the reasons for trade or industrial action or inaction in recent years, there would be "wigs on the green." Those who cry "trust the people" seem often to be anxious for freedom to "trick the people."

One of the first duties of any government, is to prevent the tax-paying public from being tricked and defrauded; inspired deception lowers the national prestige and it was the fair deal, not "Houndsditch" false marking, that built up the trade and prosperity of the country.

This country keeps going on its manufacturing business which is largely based on "national goodwill"; winking at deception is gradually destroying the reputation of British firms, and efforts are made to block or side-track every measure likely to promote honest trade. The people want to be treated fairly; the trade Merchandise Marks Act badly wants strengthening, but in these days of ultra-professional politics it is difficult to get a craft steered through the rocks, whirlpools, and deliberately laid mines, to the desired haven of fair play.

Remedies Must Inconvenience Some People.

One cannot have remedial legislation which does not, even where fairly and properly administered, inconvenience some people; the good citizen realises this, but the difficulty is that, as with the Companies Act of 1908, as soon as the remedy begins to work, rogues misuse their brains to try and find some means to get round it, and, besides this, to-day an Act of Parliament can become almost a dead letter by departmental passive resistance.

The present state of the exchanges makes genuine reform in the matter of marking, more urgent than ever before; trades should put their cards on the table and should not be allowed to play a sort of three-card trick with the purchasing public, on the ground that it is for the public to find out.

The Government recently stated that it could only give facilities for the new Bill to go forward if there was no controversy about it—the strictly up-to-date constitutional take-it-or-leave-it attitude—as if fair play in trade was such a minor matter, while Whips were recently put on to obtain approval of the notorious Rutenberg concession. Deprived of our manufacturing prosperity, our trade and national wealth would disappear and we should become almost like Venice or the dead cities of the Baltic resorts for tourists. If the Government had wanted the question of marking to be thrashed out it would not have charged 30s. for the most recent Blue-Book on the subject.

THE ANGLO-DUTCH TELEPHONE CABLE.

The telephone cable between England and Holland, which, as already briefly announced, was inaugurated for public use on August 15th, is a further addition to the long list of loaded submarine telephone cables manufactured by Messrs. Siemens Brothers & Co., Ltd. The cable contains four cores and is loaded with inductance coils spaced about one nautical mile apart, so arranged as to permit of the use of phantom circuits. Sectional views of this cable are shown below.

Fig. 1.—Section Through Cable.

Fig. 2.—Section Showing Coils Inserted.

Since the first loaded cable was laid between England and France in 1910, practically all submarine telephone cables required by the British Government have been manufactured by this company. In addition to several cables laid between England

and France, the list comprises Anglo-Belgian and Anglo-Irish cables, and last year a cable of the continuously-loaded type was laid between Ireland and Scotland. A great deal of research and experimental work has been carried out by Messrs. Siemens in connection with the design and manufacture of loaded submarine cables, and they have been brought to a very high degree of efficiency.

Although telephonic facilities between Great Britain and Holland were only made available to the public three weeks ago, communication was actually established on July 12th last, when the Assistant Postmaster-General, Mr. Pike Pease, who spoke from his room in the G.P.O., exchanged messages with M. Westerveld, Director-General of Posts and Telegraphs at The Hague.

The greater part of the land lines connecting with the cable on the English side were erected in 1914, prior to the outbreak of the war. The cable itself was also in process of manufacture at that time and was duly completed, but it could not be laid owing to the naval operations in the North Sea. It was therefore used to provide additional means of communication between this country and France in connection with the war, and the arrangements for providing a cable for the Anglo-Dutch telephone service were postponed until hostilities had ceased.

The final section of the new cable was manufactured in June last, and the *John Pender*, a cable ship belonging to the Eastern Telegraph Co., was chartered for the purpose of laying it.

The cable, which consists of four cores each of 160 lb. copper per nautical mile, insulated with "modified gutta" percha weighing 150 lb. per nautical mile, is approximately eighty nautical miles in length. The loading coils consist of iron-wire cores over which are wound coils of insulated copper wire, and they are provided for introducing inductance into the telephone circuit, to reduce the attenuation of speech currents and so render practicable the transmission of effective speech over a cable of such considerable length.

The *John Pender* left for the cable ground on Sunday, June 25th. Buoys were put down in the North Sea to mark the route, and on the morning of Tuesday, June 27th, the ship arrived off Aldeburgh, on the Suffolk coast, where the shore end of the cable was successfully landed in the presence of the Engineer-in-Chief of the Post Office, Major T. F. Purves.

Owing to the inclement weather there was some delay in laying the cable across to Holland; but by the morning of Friday, June 30th, the cable ship had arrived within three miles of the Dutch coast. After further delays due to the stormy weather, the shore end of the cable was landed at Domburg and the cable was "proved through" to Aldeburgh. This cable is one of the longest telephone cables in the world.

It is understood that at the outset communication will be limited to calls between London and The Hague, Amsterdam, and Rotterdam, as one channel only is equipped. Two other channels will be opened as soon as the additional land wires and certain necessary apparatus have been completed. The charge for a three-minutes' call will be ten shillings.

PRACTICAL APPLICATIONS OF THE JOHNSEN-RAHBEK EFFECT.

The electrical attraction effect studied by the Danish engineers, Messrs. Knud Rahbek and Alfred Johnsen, and described by them before the Institution of Electrical Engineers in May, 1921,* has many possible applications, some of them being of considerable practical interest. From a recent article in the *Elektrotechnische Zeitschrift* it is evident that these applications are being exploited on the Continent, and the matter is one with which British engineers should keep in touch.

The basic phenomenon is the marked attraction exerted on a metal plate in contact with a semi-conductor (lithographic stone or agate) when a d.c. potential difference exists between the plate and a metal covering on the other side of the semi-conductor. If a p.d. of 440 V be maintained between a brass plate of 22 sq. cm. area and the metal covering on the other side of a lithographic stone 20 mm. thick, a force of from 750 to 1,000 grm. is required to detach the stone. If, however, a glass plate 1.3 mm. thick be interposed, a force of 10 grm. is sufficient to remove the stone. The attraction is explained by the fact that there is such (electrical) contact resistance between the surfaces of the dissimilar materials that practically the whole applied p.d. is operative between these surfaces. If the surface of the stone be moistened with alcohol, the electrical attraction disappears and a current of 0.67 mA flows when the applied p.d. is 220 V direct current; this corresponds to a resistance of 300,000 ohms. As the alcohol evaporates, the electrical attraction increases and the current decreases, finally reaching a value of one micro-ampere, corresponding to a resistance of 220 megohms. This resistance is almost entirely between the surfaces of the conductor and the semi-conductor. Under these conditions the two surfaces constitute the plates of a condenser and the relatively high attraction exerted is due to the small distance between the plates. Because the contact resistance is so high, the connection in series of several hundred thousand ohms does not appreciably reduce the attraction.

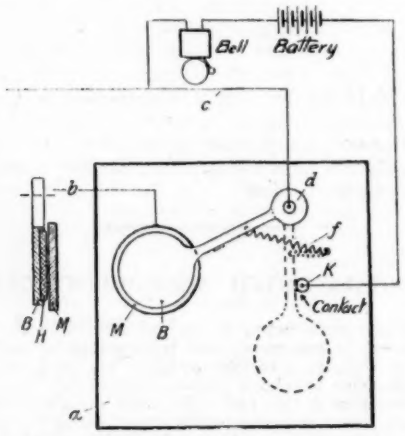


Fig. 1.—Relay Employing the "Johnsen-Rahbek" Effect.

From experimental observations of the attraction between brass and lithographic stone under various values of applied p.d. it is found (using the ordinary formula for the attraction between condenser plates) that the distance between the plates is of the order 0.005 to 0.0075 mm. Using an agate plate the attraction increases with the voltage, at first more slowly than would be expected from the condenser formula; at higher voltages, however, the attraction increases more rapidly than the cube of the voltage. If a flexible metal band be in contact with an agate cylinder for 90 deg. of arc, one end of the band being fixed and the other carrying a load of 5 kg. the latter can be raised by rotating the cylinder when the applied p.d. is 220 V and the current flowing is 0.4 mA (power = 0.08 W). In this case the mechanical load assists the applied p.d. in reducing the distance between the surfaces and the resultant electrical attraction increases more rapidly than the fourth power of the applied voltage.

The fact that relatively large mechanical forces can be exerted or controlled by the use of an extremely small current at an appropriate voltage finds many possible applications. The resistance of the leads is almost immaterial and, compared with electromagnets, the purely electrical attraction has the advantage of using much less current, and of being free from inertia. On the other hand, the electrical attraction is exerted only while the surfaces are very close together, and is affected greatly by moisture, temperature, and dust.

The principle on which relays are built for operation by currents of from 1 A to 10 micro-amps. is illustrated by fig. 1. A metal disk M is fixed in a vulcanite plate *a* and connected to one line *b*. The arm B, pivoted at *d*, is provided at H with a disk of semi-conducting material as shown in the cross section. This arm is connected to the second line *c* and, when a suitable p.d. is maintained between *b* and *c*, the plates M and H hold together. With a p.d. of 110 V, the current flowing is about 1 micro-amp., *i.e.*, the power required to hold the relay in the position shown is 0.0011 W. If the circuit *bc* be broken or the p.d. reduced to 20 or 30 V, the spring *f* pulls back the arm B and closes the contact K in the bell circuit.

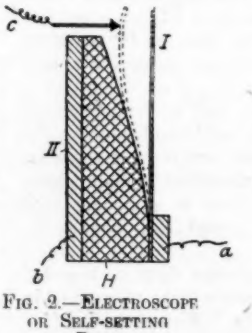


Fig. 2.—Electroscope or Self-setting Relay.

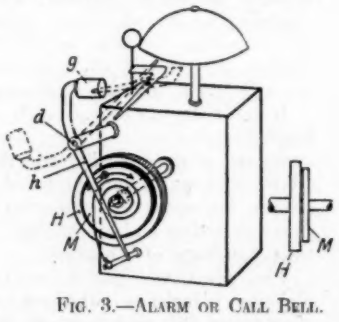


Fig. 3.—Alarm or Call Bell.

The relay shown in fig. 1 must be reset by hand (or an electromagnet can be added for the purpose), but the device

* See Elec. Rev., pp. 703, 710, 721, 722; June 3rd, 1921.

shown in fig. 2 can be used either as an electroscope or as a self-setting relay. The semi-conductor H is in permanent contact with a metal plate H whilst, on the other side, there is a flexible metal strip I clamped at *a*. On the application of suitable p.d. between *a* and *b*, the strip I is progressively drawn into the position shown (dotted). The stop *c* can be used as a relay contact or the device may be used simply as an electroscope. In the latter application the instrument is suitable for pressures of from 60 to 700 V, the plate H being connected to a point which is applied to the line, &c., to be tested, and the clamp *a* being connected to earth through the observer's body. The very small current then flowing is quite innocuous, but is sufficient to operate the electroscope.

The alarm or call bell shown in fig. 3 has a metal disk M carried by the seconds spindle of a clock; on the same spindle the disk H, of semi-conducting material, rides loosely. When a suitable p.d. is applied between M and H, the latter is held by the former and carried round with it. A pin then engages with the lever *h* and carries the latter round until the counterweight *g* passes the balance point, whereupon it falls to the left and trips the alarm catch as shown (dotted). Should the p.d. between M and H be removed before *g* reaches the balance point, the alarm is not tripped. The device can thus be used as a selective relay, the current required to operate it being only from 1 to 10 micro-amps.

Another application in which electrical attraction is used to arrest relative motion between a metal plate and a semi-conductor is shown in fig. 4, which illustrates a Morse recorder. Normally, the pen S carried by the vibrator A makes a broad record on the strip, the metal plate M being meanwhile drawn to and fro on the semi-conductor H. When the incoming signal applies p.d. between M and H these plates

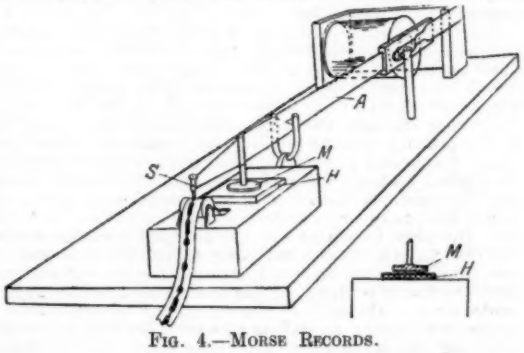


Fig. 4.—Morse Records.

hold together, arresting the vibrator and causing the pen to trace a fine line which is quite distinct from the broad record representing a space. The inertia of the moving system is small, and it is claimed that this recorder is more sensitive and can work at higher speeds than the electromagnetically operated "inker."

In many cases there is advantage in using a flexible metal band and a rotating cylinder of semi-conducting material, the small normal frictional grip between the two being increased enormously by the application of a suitable p.d. For example, the high-speed recorder shown in fig. 5 is actuated by a nickel-steel band I resting on a polished cylinder H of

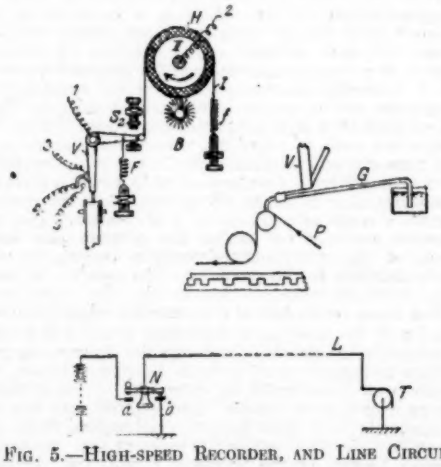


Fig. 5.—High-speed Recorder, and Line Circuit.

agate carried by the spindle H. One end of I is attached to a variable tension spring *f* and the other to a bell-crank lever V, the outer end of which carries a recording siphon as shown by the centre diagram, fig. 5. The cylinder H is rotated continuously in the direction shown by the arrow and, when a signal impluse reaches the terminals 1, 2, the band adheres to the cylinder and V is drawn up against the stop s_2. When the signal ceases V is returned to its normal position by the spring F, a stepped record being thus produced. If the minimum p.d. required to produce adhesion between H and I be 70 V, this potential is applied permanently and the spring *f* is adjusted until H just slips freely within the band. The pressure required in the signal circuit to produce adhesion is then about 10 V. In other words, instead of requiring 50 micro-amps. at 80 V in the signal circuit, there is only needed 10 V, and the small current corresponding to this supplementary p.d.

If required, the lever V may carry a small arm connected to the line 3 and moving between the contacts 4, 5, for the automatic resending of the signals received.

The general arrangement of the line circuit is shown in the lower diagram, fig. 5. The recorder can be set to receive

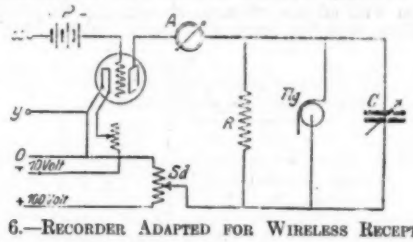


Fig. 6.—Recorder Adapted for Wireless Reception.

from 400 to 2,000 letters per minute by a single lever which adjusts the speed of the agate cylinder and paper strip, and also the amplitude of the recording arm and contact relay. Resistances of 1 megohm or more do not affect the operation of the recorder; hence the section of the line conductor may be reduced to the minimum required for mechanical strength.

For the reception of wireless signals, the recorder may be connected as shown in fig. 6. A polarising potential is applied to the recorder T*lg* and adjusted by the potentiometer *sd* and the resistance R. Incoming signals pass from the terminals *xy* to the amplifying valve, which then augments the p.d. on the recorder and produces the corresponding record.

Another application of the agate cylinder and metal band is to the operation of a loud-speaking telephone. One end of the metal band is attached to the centre of the telephone membrane and the other to an adjustable tension spring. Microphone currents, amplified if necessary, bring about adhesion between the rotating cylinder and the band so that the membrane can be vibrated with any desired mechanical power within reason. The polarising voltage applied in this case must be such that the controlling device operates on the linear part of its voltage-force characteristic, otherwise distortion of speech is produced.

DUPLEX WIRELESS TELEPHONY.

Recent Experiments.

While simplex wireless telephony is serviceable when messages are transmitted by trained operators, the necessity of continually manipulating the equipment for alternate transmission and reception makes the system unsuitable to the general public. The initial incentive for the development of a satisfactory duplex system lay in the desire of steamship passengers to converse by telephone with persons on land, and an article in the *General Electric Review*, from which the following details are abstracted, describes tests that were recently conducted with this end in view. Their successful results are highly gratifying to the participants: the Radio Corporation of America, the American Telephone and Telegraph Co., the Western Electric Co., and the General Electric Co.

True duplex radio telephony permits the operator to send and receive simultaneously as with the ordinary telephone. Unless one conversant can at any moment interrupt the other, a conversation may lose coherence and the transmission of a long message may often entail irksome repetition. Moreover, ship to shore telephone communication, in order to render the maximum amount of service, must be capable of being linked up with the regular wire telephone system.

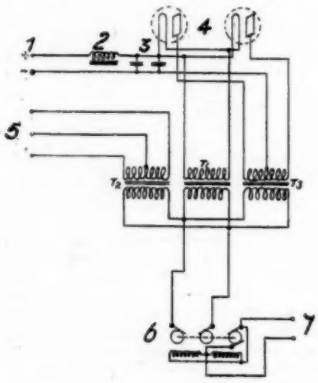
During the months of February and March a number of tests were made on the s.s. *America*, and their results are indicative of the future possibilities of radio telephony. The shore station, where the radio and land lines were linked together, was located at Deal Beach, N.J., and was connected by a toll line to a telephone switchboard in New York City. By means of this arrangement communication could be carried on from the ship to any point reached by the regular wire telephone system.

The input to the antennæ on the *America* was approximately 750 watts; the Deal Beach station uses an antennæ input of about 1,500 watts, and duplex telephony was carried on over a maximum distance of 1,600 miles at night range under good atmospheric conditions. During the daytime reliable conversations were held at distances of between 400 and 500 miles.

When it is desired to call a party on shore, the standard practice used for a toll call in wired telephony is followed. A

regular desk telephone was installed in Capt. Rind's quarters on the *America*. When he desired to talk to someone on shore he called the ship's radio operator, who, after ascertaining the telephone number, or the name of the party desired on shore, established communication with Deal Beach. The operator at Deal Beach transferred the call to the New York toll line, thus completing the circuit between the *America* and the switchboard operator at New York, so that both operators could exchange information regarding the call. When New York had the party at that end, the ship's operator called Capt. Rind and he conversed from his extension in the same manner as if he were using an ordinary telephone system.

For reception a highly selective receiver was used in conjunction with an anti-resonant circuit, and transmission thus took place at a frequency of 800,000 cycles (375 metres).

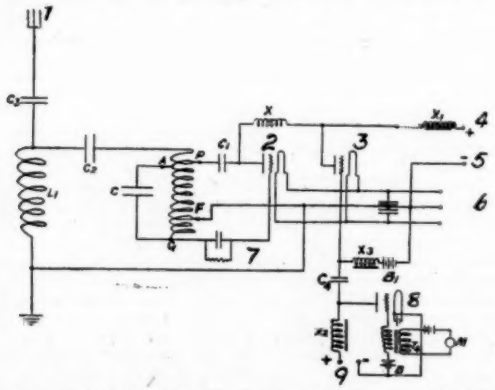


1, 10,000-V, d.c. supply; 2, filter reactor; 3, filter condenser; 4, kenotrons; 5, radiotron filament supply; 6, 120-V, 500-cycle motor-generators; 7, ship's d.c. supply.

Fig. 1.—Kenotron Circuit Diagram.

Modulation, or speech control, of the transmitter output took place either at the operator's control unit or at the extension station. While conversations were being carried on the transmitter oscillated continuously into the antennæ system.

The apparatus used for the tests is as follows:—The duplex transmitter direct-current supply at 10,000 volts for the plate circuit of the tubes is obtained by means of a full-wave single-phase 500-cycle kenotron rectifier. The plate and filament energy for the kenotrons is obtained from a 500-cycle generator operating on the 125-volt direct-current ship mains. Two kenotrons are provided and a schematic circuit diagram of the kenotron panel is shown in fig. 1. The motor generator is started by a push-button in the operator's control unit. The transformers T_1, T_2 and T_3 have their primaries connected to the 120-volt 500-cycle supply. The kenotron filaments are heated by transformer T_1 at a potential of 11 volts. In like manner transformer T_2 delivers a secondary voltage of 11 volts for the radiotron tube filaments mounted in the radio unit. The plate transformer T_3 delivers a secondary voltage of approximately 25,000 between outside terminals. It will be observed that these terminals connect to the plates of the kenotrons. This results in full-wave rectification of the trans



1, radio panel; 2, oscillator; 3, modulator; 4, filter reactor in kenotron panel; 5, 10,000-V supply; 6, 11-V, a.c. supply with neutral wire in centre; 7, grid condenser with leak; 8, speech amplifier; 9, 125-V supply.

Fig. 2.—Radio Panel Circuit Diagram.

former output, producing a pulsating direct current which is smoothed out by the filter condensers and filter reactor. Three rheostats control the motor speed, alternator voltage, and filament voltage. A filament voltmeter is provided, and is the only meter that requires supervision on the part of the radio operator.

The radio panel provides for the generation and speech control of high-frequency energy over a frequency band of from 1,000,000 to 375,000 cycles. This corresponds to a wave-length range of from 300 to 800 metres. A six-position wave-change switch and a signal switch are provided, so that telephony and continuous-wave or interrupted continuous-wave telegraphy may be used if desired. The anti-resonant circuit is tuned by a small knob on the lower section of the panel. The motor-driven chopper gives a 1,000-cycle note when interrupted continuous-wave telegraphy is being used. Two radiotrons are used, one of which operates as an oscillator and the other as a modulator. A radiotron is also used as a speech amplifier. The current flowing in the antennæ system is indicated by a radiation ammeter.

The fundamental circuit arrangement of the radio panel is shown in fig. 2. The oscillator tube draws its plate supply through a radio choke coil X. A shunt circuit for coupling the plate radio frequency to the antennæ circuit consists of the condenser C_1 and the turns in use on the inductance L between points P and F. The radio choke is used in order to prevent the plate radio frequency from flowing back into the 10,000-volt direct-current supply. Excitation for the oscillator grid circuit is furnished by the voltage built up between turns F and G. The frequency of the oscillations is determined by the condenser C and the inductance between turns A and G. This oscillating circuit is loosely coupled to the antennæ circuit through the condenser C_2. Sufficient turns are used on the loading inductance L_1 to bring the antennæ circuit into resonance with the intermediate circuit. One of the major requirements of this system of duplex transmission is that the frequency of the radio output of the transmitter shall not change, due to the swaying of the antennæ. This is accomplished by using such a low value of capacitance in the coupling condenser C_2 that variations in antennæ constants cause only a detuning effect and do not greatly react on the frequency setting circuit L C.

The method of modulating the high-frequency output of the transmitter in accordance with the voice vibrations is accomplished by means of the "constant-current" system. It will be observed in fig. 2 that the plate of the modulator tube is connected to the transmitter side of the filter reactor. Upon speaking into the microphone M variations take place in the primary current of the transformer T_4. This transformer has a step-up ratio, and therefore increased variations are applied between the grid and filament of the speech-amplifier tube. A biasing battery B is used in the grid circuit of this tube in order to provide a linear operating characteristic. The plate circuit of the speech amplifier tube contains a reactor X_2. Due to the audio-frequency changes in grid voltage, amplified variations are built up across X, and are transferred to the grid circuit of the modulator tube through the condenser C_4. The grid of the modulator tube is biased by means of a battery B_1, and is also provided with a choke X_3 to prevent the input to the grid from flowing to the filament through the battery instead of through the tube. The plate current now flowing into the modulator tube must pass through the main reactor X_1, and in doing so it builds up an electromotive force around this reactor of the same wave form as that originating in the microphone circuit. This potential is applied directly to the plate of the oscillator tube. Since the current in the antennæ circuit varies almost directly with the oscillator plate potential, it is evident that the antennæ output will be modulated in accordance with the voice vibrations applied to the microphone.

The radio receiver cabinet is built with seven shielded compartments, so that when closed the various circuits are shielded one from another. A total of eight radiotrons are used.

Filament supply for the radiotrons is furnished by a 6-volt 120-ampere-hour storage battery. Three 22-volt dry batteries are used for plate potential. The antennæ circuit is tuned by means of a variable condenser and a tapped inductor. Provision is made for accurate variation of the coupling between the antennæ and secondary circuits, all tuning in the latter being accomplished with a variable condenser. Three filament rheostats are used to adjust the detector and amplifier tubes and a wave-changing switch controls the range of the radio-frequency amplifiers. One position of this switch gives a wave-length range of from 250 to 500 metres, while the second position gives a range of from 500 to 4,000 metres. Two variable condensers are used for tuning the primary and secondary portions of the intermediate-frequency circuit, in which a variable coupling is also provided. The receiver is connected to two telephone plugs, which enable the audio-frequency amplifier to be connected or disconnected when required.

The log of the tests made from ship to shore indicates that approximately 125 people talked over the system, the majority of whom had never used a radio telephone before, but no difficulty was experienced in carrying on conversation as easily as over a land 'phone. The longest land line connection was made from New York to Washington, D.C. On this occasion Captain Rind, while 200 miles at sea, conversed with Chairman Lasker, of the Shipping Board. Mr. Lasker used the regular desk 'phone in his office. An idea may be gained of the extreme sensitivity of the receiving equipment on the *America* from the fact that two amateur stations were heard when the *America* was 2,000 miles out. When 1,100 miles out the 8.30 p.m. concert of WGY Schenectady broadcasting station was received very loudly and clearly.

A considerable amount of radio traffic is handled by the operators on large transatlantic liners. This may eventually require simultaneous telegraphy and telephony, and tests are

now being made on the *America* with this object in view. It is, therefore, not improbable that in the future a passenger may be telephoning from a liner while at the same time the radio operator will be transmitting radiograms with the telegraph equipment.

ELECTRICITY SUPPLY FOR THE S. E. & C. R.

Electricity Commissioners' Statement.

The Electricity Commissioners have issued a statement with respect to the inquiry they held on May 30th, 1922, in connection with the applications (*a*) of the Managing Committee of the South-Eastern & Chatham Railways to the Electricity Commissioners for their consent under Section 11 of the Electricity (Supply) Act, 1919, to the establishment of a generating station at Angerstein's Wharf, Charlton, to contain 60,000 kW of generating plant, and (*b*) of the West Kent Electricity Co., Ltd., for the consent of the Commissioners to the establishment of a generating station at Belvedere, in the Urban District of Erith, to contain 150,000 kW of plant.*

During the course of the inquiry offers to supply the Railway Co. were made by the West Kent Co., and by the County of London Electric Supply Co.

An important factor in this case is the forthcoming grouping into one railway system of the London & South-Western, the London Brighton & South Coast, and the South-Eastern and Chatham Railways. The L. & S.W.R. Co. is supplied from its 25-cycle generating station at Wimbledon. The L.B. and S.C.R. Co. purchases its 25-cycle energy from the London Electric Supply Corporation's station at Deptford. The further electrification of that railway's suburban lines will entail a supply which will be many times in excess of that now given by the London Electric Supply Corporation, and this further supply must be given at a frequency of 25 cycles for the reason that the equipment of the company's rolling stock is designed for that frequency. The S.E. & C.R. Co. also desires a 25-cycle supply, but as its railway electrification will be on the direct-current system, a supply at a frequency of 50 cycles is also practicable.

The Railway Co.'s site is 26 acres in extent, of which 20 acres are to be appropriated to the generating station. The application is to construct immediately a station containing 60,000 kW of generating plant and the Railway Co. contended that it would be possible to extend the station to at least 150,000 kW in order to meet the further electrification of the suburban lines of the S.E. & C. Railways and of the L.B. and S.C. Railway.

Only outline plans of the station were submitted, and the principal technical witness on behalf of the Railway Co. agreed that in any case a complete modification of this design would have to be made. The Commissioners, while of opinion that the site is suitable for a 60,000-kW station, have considerable doubt whether a station of an ultimate capacity of 150,000 kW can be economically constructed on this site.

The Railway Co. expects to complete the first stage of the electrification of its lines by June 30th, 1925, and has made arrangements with the Treasury for a guaranteed loan of 6½ millions, 5 millions of which is to be expended on the electrification of the lines. This financial assistance is dependent upon the scheme being begun forthwith. From June 30th, 1925, the interest on this sum and contributions towards a sinking fund must be provided for, and unless the Railway Co. is able to rely upon a supply of electricity by that date, the working of the new system will be delayed and the increased revenue anticipated therefrom will not be forthcoming to meet these charges when they mature. The Railway Co. if it purchases electricity from an outside source, will therefore require to be protected against any loss arising from a failure to give the supply by the date required. Moreover, the Trade Facilities Act Advisory Committee is similarly interested from a financial point of view.

The Commissioners have concluded that it has been proved to their satisfaction that there are two authorised undertakers *willing* to give the Railway Co. a supply of electricity adequate in quantity and regularity to meet the present and prospective demands of the Railway Co. at a cost not greater than would have been incurred by the Railway Co. in supplying itself. The Commissioners, however, cannot refuse consent to the Railway Co. unless it has been also proved to their satisfaction that the authorised undertakers are, or will be, in a position to give such a supply.

(*a*) The West Kent Co. has prepared detailed plans for its stationon the Belvedere site, and is authorised to supply energy to the Railway Co. within the West Kent area. In pursuance of the Electricity (Supply) Act, 1922, energy so supplied to the Railway Co. may be used by the Railway Co. for haulage or traction or the lighting of vehicles on any part of its system. The West Kent Co. has hitherto operated only on a small scale, and is at present dependent for its bulk supply almost wholly upon the South Metropolitan Light and Power Co. Both companies' shares are held largely by the Metropolitan Carriage, Wagon & Finance Co., Ltd., which company is prepared to find the necessary capital to equip the Belvedere station and to construct the necessary transmission lines. A director of the West Kent Co., who is also the chairman of the Metropolitan Carriage, Wagon & Finance Co., Ltd., stated that the latter company would not be a party to an agreement to guarantee payment of damages in the event of the West Kent Co. failing to give a supply by the required date, though he considered that the Metropolitan Carriage Co. would have to advance the necessary money to the West Kent Co. should the latter company be found liable. The West Kent Co. intimated, however, that it would not proceed with the erection of the Belvedere station unless it secured the contract with the Railway Co. which it stipulated should be for a minimum period of 60 years.

(*b*) The County Co. holds the consent of the Commissioners for the construction of a 100,000-kW station on the Barking site, the plans have been approved by the Commissioners, and it is proceeding with the erection of the station. The County Co. *is prepared*, with or without consent for any extension of the station, to give a supply to the Railway Co., and contemplates a contract period of 25 years. Matters involving further consent and arrangements being obtained or made by the County Co. before a supply could be given to the Railway Co. are:—

(1) The construction of a cable tunnel (6 ft. in diameter) under the river Thames, and the Commissioners have satisfied themselves that no particular obstacles stand in the way of the construction of this tunnel well within the period of completion of the Barking station and the electrification of the Railway Co.'s lines by June 30th, 1925. The County Co. could also supply by an alternative route if necessary.

(2) The routes of the transmission lines for which further consent of the Commissioners is necessary. Under the Electric Lighting Order Confirmation (No. 7) Act, 1913, particulars of proposals to lay interconnecting mains between the Barking station and the areas of supply within the Administrative County of London must be furnished to the London County Council, which is entitled to make representations to the Commissioners and to be heard thereon.

(3) The extension of the County Co.'s transmission lines, (unless further powers be obtained), beyond the point of delivery at Lewisham determined by the Railway Co. to a point in the County Co.'s area of supply in Camberwell, where the latter company would be entitled to supply the Railway Co. This would involve the transmission lines being doubled back to Lewisham by the Railway Co. at the cost of the County Co.

Having fully considered these and other relevant matters, the Commissioners are satisfied that there is an authorised undertaker who will be in a position to give the Railway Co. a supply by the date when the electrification of the lines is expected to be complete, *viz.*, on or before June 30th, 1925.

Factors to which it is essential that the Commissioners should have regard in the public interest are as follows:—

(*a*) The evidence given by experienced railway engineers to the Electric Power Supply Committee of the Board of Trade (1917-18) as to the advantages of combining the supply to railways, tramways, and other classes of consumers (Cd. 9062; page 9).

(*b*) The general attitude of the railway companies represented at the inquiry into the London and Home Counties Electricity District in 1921, which was that if a sufficient supply could be afforded in time by a Joint Authority or other authorised undertaker at a cost not exceeding that at which the railway companies could themselves generate the railways would avail themselves of it.

The L.B. & S.C.R. Co., one of the future group to which the Railway Co. will belong, has "purchased its supply from an authorised undertaker for many years past and the supply "had been perfectly satisfactory from an outside source." Moreover, the evidence showed that there would be a substantial saving in capital expenditure from the adoption of a combined source of supply. If the Railway Co. purchases its supply from such an outside source it will be relieved from capital outlay to the extent of over one million pounds.

In view of the foregoing circumstances the Commissioners have concluded that it would be no disadvantage to the Railway Co., and would be a gain to the public interests concerned, if the Railway Co. were to take its supply from an outside source. The evidence of the Railway Co. at the inquiry was to the effect that it was prepared to consider taking a supply from an outside source, subject to satisfactory guarantees as to cost, reliability of supply, and time of delivery. The Commissioners are strongly of the view that the Railway Co. ought to enter into immediate negotiations with the authorised undertakers and discuss the actual terms of a firm contract, including a guarantee to indemnify the Railway Co. in the event of the authorised undertaker failing to give the supply by the required time.

The Commissioners fully realise the urgency of the matter from the point of view of the early commencement of the electrification scheme, but they are of opinion that, having regard to the important interests involved, the parties should be given a further opportunity of conferring together in order to arrange a mutually acceptable contract. The Commissioners have, therefore, postponed their decision to enable this to be done. The Commissioners are of opinion that if the negotiations are conducted in a spirit of mutual goodwill the terms of such a contract can be adjusted without undue delay.

* Elec. Rev., June 9th, 1922; p. 799, and July 14th, 1922; p. 45.

REVIEWS.

The Induction Motor and other Alternating-Current Motors. By B. A. Behrend. Second edition. Pp. xxiii+272. London: McGraw-Hill Book Co. Price 24s. net.

This is the best example of the diary or autobiographical style, now so much in vogue, that we have met with in a technical book; and as for trumpet blowing, the blasts are so loud that any praise from a reviewer would hardly be heard above the din. Right at the outset the reader soon discovers that the author has something of a grievance in the matter of priority (reminding one of the present-day controversies in the wireless world). Though in the inordinately long preface a short sermon is preached on the text "A prophet is not without honour, save, &c." yet the admission of the author's claims entitles a writer to be called "a great savant and a gentleman." Then follows sound advice to the young reader of the present generation: "Let him not trouble his head with recognition"; but despite this, Mr. Behrend evidently finds that it is more blessed to give advice than to receive it, for no sooner do we come to the introduction than we are at it again. We now find ourselves inveigled into a fierce tussle round the invention of the circle diagram for the induction motor. Without attempting to prejudge this issue, we can at least state that to the vulgar mind the name indissolubly associated with the circle diagram is that of Heyland. One thing also we might say regarding the author's grievance against writers—it is not always the writer's fault that due recognition is not given to the true originator, for an author—especially of the age of Mr. Behrend when he first wrote about the circle diagram—often finds his paper edited without his being consulted on the matter. And, after all, if we do not always receive recognition according to our merits, many of us know full well we are not dealt with according to our sins. In addition to this, personal controversy is not becoming in a textbook, though we gladly admit that in this case the matter is both interesting and readable.

Coming to the chapters, a good deal of space is taken up with the representation of losses, &c., in the circle diagram, but the reader is not told that most of this is of little practical use. The mode of treatment is not always easy to follow.

The author's theory is troublesome in places, *e.g.*, when he writes, rotor current = e.m.f./resistance, making no mention at all of inductance—on which, among other things, the maximum torque depends. Also the method of treating the torque is antiquated, the conditions governing it being treated very meagrely. Again, in speaking of higher harmonics in the field the reader is referred to the well-known pointed m.m.f. curve of the 3-phase motor, and the author proceeds to consider therefrom a two-phase motor. Moreover, the uninformed reader would be allowed to assume that this m.m.f. curve possesses a third harmonic, for no analysis of this curve is given, and no explanation is offered how a third harmonic of flux can exist in a 3-phase motor.

In speaking of the induction generator, the author objects to Prof. Pupin's conception of a "negative resistance," which he regards as making a complicated subject more complicated by mystery. Instead of offering any alternative explanations, he winds up with: "As one never understands anything which one has not thought out for oneself, we shall leave these matters to the reader." This reminds one of the way of the consulting engineer, who when faced with some awkward point, gets out of the difficulty by specifying that the work must be carried out "in an approved manner." We might also recommend the remark to teachers as a suitable variant of "It can easily be shown. . . . .

We cannot agree with the author's sweeping assertions about the difficulty of properly calculating leakage, &c.—the views expressed would be much more correct in the first edition in 1901 than in the present edition.

This brings us to the second half of the book and to a change of subject, namely, alternating-current commutator motors. The treatment is brief, but in character is scarcely suitable for beginners. In Chapter X the reader is told that the series polyphase motor was first described by Wilson in 1888, and in Chapter XI the credit for both shunt and series motors of this type is given to Görges under date 1891. The chapters on methods of speed control and of raising the power factor are good and among the most useful in the book.

The remaining chapters are devoted to the various types of single-phase motors. In most cases the description is very brief, but we very readily acknowledge the author's attempt to give due credit to the several inventors for their work.

Summing up we must say frankly that reading the book has been rather a disappointment. Quite apart from the personal side and from the several matters with which we disagree we cannot see for whom the book is intended. As regards theory, there seems to be little that has not already been said in the same way years ago, whilst design and construction are scarcely touched upon.

Candidly, we think Mr. Behrend has not done himself justice in the present book. Much of Mr. Behrend's work has had our strongest admiration and we are glad to think that this has not been lessened by the fact that the present book does not seem to be equally meritorious.

Handbook of Commercial Geography. By George G. Chisholm, M.A., B.Sc. (Edin.).—Ninth edition. (Pp. 824+13 maps). London: Longmans, Green & Co. Price 25s. net.

If economics is the "dismal science," surely geography is the most neglected. Commercial geography—the "practical" side of the subject—plays a most unimportant part in the curricula of the majority of modern schools, although, without doubt, to a commercial nation with so many foreign connections as Great Britain the science is one of more than ordinary importance.

Mr. Chisholm's "handbook," the size of which is out of proportion to its description, represents an enormous amount of labour. Although the present edition is the ninth, conditions have so changed since the 1911 edition that rearrangements, revisions, and additions have virtually made it a new book.

The introductory portion of the work takes the form of an essay on commerce between nations, in which it is shown how each country takes advantage of its natural endowments. The delicate question of tariffs is introduced, which leads to the consideration of "key" industries, discovered by the war. The duties of consuls are touched upon; here we think the trade commissioner services of Great Britain and the United States might have received special mention instead of a passing glance. In the section dealing with economic statistics the author emphasises their value to commercial geography as helping to distinguish the important from the unimportant, and as a record of changes indicating a course for future action. A warning is uttered with regard to the use of statistical tables of trade; the fact that values are given in the absence of quantities (in any case the latter would be rather unwieldy) has a tendency to mislead the reader, and the use of index numbers is imperative. It is, however, acknowledged that even these can never be completely satisfactory owing to the lack of an absolute base.

The handbook proper commences with a study of climatic and physical conditions and their effects, and this leads up to a consideration of the treatment of the soil, the question of labour and machinery, &c. Some space is occupied by a review of the means of exchanging commodities—transport being the principal consideration. The question of the size of truck on railways is discussed, a note being made of the 80-ton coal trucks designed for use on an American line. It is stated, with truth, that legislation has considerably retarded the use of electricity for motive power in this country, but the author also considers motor vehicles a hindrance to the development of light railways and tramways. Marine transport is dealt with principally from the trade-route point of view, and methods of propulsion are not considered very fully. Telephonic and telegraphic communication is briefly mentioned. Some interesting notes appear in a section upon instruments of exchange—currency, bank notes, bills, &c.

All the above is a prelude to the main body of the book, which falls into two main parts: that embracing commodities, and a regional geography.

The former part is a concise review of the earth's staple products, and foodstuffs occupy the most important place. These are arranged according to climatic zones. Other vegetable products are included in this part, and rubber and gutta percha receive attention. Following a chapter on fisheries is a long treatise upon mineral products, in which the world's coal production and consumption is set out very clearly. The inferior and immature classes of coal are also touched upon. Iron and steel production forms the subject of several pages, in which reference is made to the ever-increasing use of the electric furnace in this connection. The sources of petroleum are then described. Copper, zinc, and tin are dismissed in a very few words, along with the less used metals, and aluminium appears in a list of "minor minerals," although it is given almost as much space as copper. The last portion of the "commodities" section covers manufactured articles, including paper, leather, glass, earthenware, and porcelain. The regional section opens with a chapter upon Europe, particular attention being paid to Continental trade routes. A chapter on the British Isles follows. In this the distribution of various industries is shown, means of communication and transport are described, and the commercial advantages and disadvantages possessed by the nation are discussed at some length; a number of useful statistics are included in this part. Other European countries follow, including Russia and the new states formed upon the conclusion of the war. The arrangement by continents is continued, but British dominions and possessions are given more space than other countries.

Appendices occupy 84 pages, and include a host of commercial statistics for four-year periods from 1871 to 1913, and a list of alternative geographical names (with pronunciation). The latter is certainly of value when such a familiar name as "Lemberg" is converted to Lwow. An index of 40 pages forms a very complete guide to the text. We must not omit to say that the maps provided render the work very complete, although most of them are designed to bring out one main feature of a region, *i.e.*, railways, coal deposits, &c.

Practical Electricity. By W. E. Ayrton, F.R.S., and T. Mather, F.R.S. Pp. 547; 300 illustrations. Fourth edition, 1921. London: Cassell & Co., Ltd. Price 15s. net.

The publication of a fourth edition of this famous text book reminds us that it is exactly a quarter of a century since Prof. Ayrton wrote his preface to the second edition. It would indeed be difficult to estimate the effect of Prof. Ayrton's life and teaching upon the generation of electrical engineers which sat at his feet at Finsbury and South Kensington; still more difficult to gauge the value of his writings to the much wider circle of students among whom the earlier editions of "Practical Electricty" gained such well-deserved popularity. The present edition has enabled Prof. Mather, who has so ably continued the work of Ayrton, to bring this standard text-book entirely up-to-date.

The symbols have been modified in accordance with the list adopted by the International Electrotechnical Commission, the sections on Dry Cells have been re-written, and that on Storage Cells amplified to include the Edison battery. The short history of the absolute unit of resistance and of the electrical standards of the Board of Trade, which in Ayrton's original work occupied a bare thirty pages, has now a sixteen-page addendum, bringing the account of the absolute measurements of resistance up to the year 1914, and referring in detail to the recent work of Mr. F. E. Smith and Prof. Mather on Electro-Chemical Equivalents and the E.M.F. of Standard Cells.

For the first-year student of electrical engineering who has good facilities for doing practical work, there can be no doubt that this book is the very best possible laboratory manual. By dealing in so thorough and quantitative a manner with the fundamental phenomena of electricity and magnetism the way is adequately prepared for the later work on dynamo-electric machinery, and all the multitude of present-day industrial applications of electrical science.

The rising generation of electrical engineers may go much farther and fare much worse than by adopting the text-book which, in its less attractive and nineteenth century form, served as the groundwork of their fathers' knowledge of practical electricity.

P. H. S. K.

The Signal Service in the European War of 1914 *to* 1918 (*France*). By R. E. Priestley, M.C., B.A. (late Major, R.E.). Pp. 359; 23 plates. Chatham: W. & J. Mackay and Co., Ltd.

The credit for the successful outcome of the four years' operations in France has been claimed by every arm of the service, and not without justice, for although the part cannot be greater than the whole the lack of a single component may render a body or organisation totally ineffective. It may truthfully be said that but for "Signals" the conduct of operations on such a scale would have been impossible; this was a lesson learned very early in the war when the signal service was considered to be merely a messenger staff, acting between G.H.Q. and battalion headquarters, It was then thought sufficient if communication between units was maintained by regimental signallers, and co-operation between artillery and infantry was effected by means of arrangements made by the former arm. Consequently, the signal service operating with the original expeditionary force was represented by 72 officers and 2,200 men, a well-trained and efficient body but inadequate to the needs of the situation. Apart from this there was no unification of command in the signal service, each separate unit acting virtually on its own initiative, although loyally co-operating when necessary with other units. The principal media of communication at this time were the telegraph and message carriers. The telephone, although highly developed in the French and German armies, occupied a subordinate position in our service, and the D Mk.I and D Mk.II field sets possessed many disadvantages, some of which, however, were eliminated in the design of the D Mk.III. The advantages of the magneto telephone failed to combat certain prejudices in spite of useful experience gained by the operation of the French civil system in occupied areas. The enormous growth of the message traffic between G.H.Q. and subordinate commands, however, rendered more speedy and efficient methods imperative and the magneto telephone appeared, and with it sprang up hundreds of new lines. This brought confusion in its wake until the introduction of the switchboard and the metallic circuit. The question of maintenance then became acute, for apart from the destruction of lines by shell-fire, the spirit of acquisition was rampant among the troops; this led to the burying of lines, and the fact that no depth less than 6 ft. was safe made the task extremely onerous, and rendered the system rigid. The alternatives often employed were the use of armoured cables and the "grid" system of interconnection. Turning to organisation, the author shows that it was not until 1916 that proper co-ordination was affected by the appointment of Deputy-Directors of Signals at Army H.Q. and officers directly responsible to them in each division. It was about this time also that the Artillery communications were taken over by "Signals"—this being gradually brought about by co-operation between individual officers of the two arms. From this time forward the history of the Signal Service takes the form of continual refinements and improvements culminating in the highly-efficient organisation existing at the close of the war.

Apart from telegraphy and telephony, the author has a great deal to say of other signalling methods. The heroism of the motor-cycle dispatch riders is given well-earned commendation. These men worked under the worst possible conditions, always exposed to danger, and their casualty list was unfortunately a heavy one. The development of the carrier-pigeon service receives mention; the part played by these birds is not generally realised. Wireless telegraphy made sporadic appearances but did not meet with general approval, as it lacked the essential of secrecy, which the best-contrived codes could not ensure. Unreliability of apparatus was another factor working against its adoption in the earlier days of the war. The "loop" wireless sets, however, had a limited use. These were light and compact, had short aerials, and employed short wave lengths (65 and 80 m.); they were of considerable value in trench signalling having a range of from two to three thousand yards. Continuous wave wireless telegraphy was also developed to some extent for artillery work. The use of the "Fullerphone" and its variations is dealt with at some length.

The author describes all these, and subsequent developments with a wealth of detail which indicates an intimate acquaintance with the subject. By means of the plates it is possible to trace the gradual growth of the signal system in various areas occupied by our troops; the appendixes give particulars of personnel, &c., of signal formations.

In conclusion, it may be said that the volume is a record of hard work, carried out in the face of many difficulties. The failure of the author to mention names in his history may detract from its interest to members of "Signals," but it has to be realised that where all concerned were worthy of special mention the selection of a few names would be invidious.

THE TRADE UNION CLAUSE IN CONTRACTS.

Mr. A. Carson Roberts, District Auditor, has given in writing his reasons for surcharging fifteen members of the Southwark Borough Council belonging to the Rating Committee in connection with a contract for printing rate books. Amongst the firms tendering one eliminated a declaration to the following effect: ".....hereby agrees that.....firm employs trade-union labour in all its departments and pays the rate of wages and observes the hours and conditions of labour recognised or agreed upon between the trade unions and associations of employers and in practice obtained in the London district, and.....do hereby undertake in carrying out my contract between.....and the Council to pay the rate of wages and observe the hours and conditions of labour recognised or agreed upon between the trade unions and associations of employers, and in practice obtained in the London district; or in the absence of such recognised wages and conditions not less than the standard rate of wages paid and hours observed and agreed upon between employers and workpeople in the district where the work is being carried out, or in the absence of any such agreement, the rate of wages and hours of labour which are acceptable to the trade unions of the trades concerned, and that.....agree to a condition being inserted in the contract to carry out this undertaking."

On a tenderer striking out this declaration and sending in an altered tender form, the Rating Committee refused to consider it, and accepted one from another firm involving an extra expenditure of £293 19s. 6d. in six months.

Mr. Carson Roberts, in his written judgment, said that in 1913 a complaint was made to the Council by a trade-union officer that the Council's fair wage clause was not being duly observed by this firm, who had held printing contracts with the Council since 1900, and a sub-committee, who investigated the allegations, reported that the firm did not pay trade-union rates throughout their establishment, but that they invariably did so in connection with the Council's work. The Town Clerk was then instructed to report as to amending the existing clauses relating to the observance of trade-union conditions, with a view to amending them so that they would apply to each contractor, and he reported to the effect that such a condition could not be imposed in law.

In 1920 the matter was again taken up, when the Council adopted the declaration given above as a by-law to be imposed upon all tenderers. It was contended by those adopting this declaration that the employment of some trade-union labour in each department would satisfy the condition which the words "employs trade-union labour in all its departments" imported, and he (Mr. Carson Roberts) was of opinion that this was the true interpretation of the words used. The tenderer in this case wrote to the committee pointing out that whilst he agreed to pay the trade-union rate of wages and observe the hours and conditions of labour agreed upon between trade unions and the employers' associations, he had a few employés, some of whom had worked for the firm for thirty to forty years, who did not belong to a trade union, and whilst he continued to pay them the standard

wages, he could not conscientiously compel them to join any trade union.

It appeared, however, that the committee did not report to the Council the financial advantages of the tender in question. In view of the documents which were before them at the time it could not correctly be contended that they found this firm unwilling to comply with the conditions which the Council had imposed or sought to impose by their declaration. If they were of opinion that these conditions did not require the exclusive employment of trade-union labour they could and should have removed the difficulty which, according to their minute, caused them to reject this tender, and if, on the other hand, they were of opinion that these conditions did require such exclusive employment, it was not incumbent upon them to observe such a condition.

Their rejection of this tender, added the District Auditor, was, in the circumstances of the case, an imposition by them of the exclusive employment of trade-union labour as a condition precedent to the consideration of the tender, and in imposing such a condition upon the tenderers to employ trade-unionists exclusively they were guided by considerations prejudicial to the ratepayers, which should not have weighed with them in discharging the duty entrusted to them by the Council, and in so doing they were imposing a condition which operated unreasonably in restraint of trade or of competition. As was shown by their minute on the subject and by the action which was taken on their behalf, there was no reason which would have caused them to reject this tender apart from the unwillingness to make a declaration which, as was shown by the letters, the tenderer understood to be to the effect that he employed trade unionists exclusively.

Mr. Carson Roberts concluded by stating that the Borough Council, as a corporate body, would have a *locus standi*, and the right to take the case either to a Court of Law or to the Ministry of Health.

NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

22,019. "System of exploding air bombs, &c., by wireless waves." C. R. Jarman. August 14th.
22,024. "Electric transmission systems." A. M. Taylor. August 14th.
22,055. "Electrically-operated route indicators, signs, &c." E. Lancaster and F. R. Smith. August 14th.
22,073. "Electric relay." Hasler Akt. Ges. vorm Telegraphen-Werk stätte von G. Hasler. August 14th. (Switzerland, August 24th, 1921.)
22,080. "Dynamo-electric machines." W. B. Sayers. August 14th.
22,089. "Carrier-wave receiving systems." Western Electric Co., Ltd. August 14th. (United States, August 24th, 1921.)
22,094. "Electric battery." J. Crossfield & Sons, Ltd., T. P. Hilditch, and H. J. Wheaton. August 14th.
22,106. "Telephones." N. W. McLachlan. August 14th.
22,113. "Head lamps for automobiles, &c." A. S. Ward. August 14th.
22,118. "Timers." E. C. R. Marks (Leich Electric Co.). August 14th.
22,132. "Lamps for motor vehicles, &c." A. E. Bullock. August 15th.
22,136. "Masts for wireless aerials, &c." H. Longton. August 15th.
22,148. "Variable electrical resistances." A. E. Taylor. August 15th.
22,150. "Induction motors." T. F. Wall. August 15th.
22,155. "Receivers for telephony, &c." M. J. Mason. August 15th.
22,161. "Electric control switches and current-regulating means for motor starters, &c." Brook, Hirst & Co., Ltd., and J. A. Hirst. August 15th.
22,162. "Switchgear for electric motors." Brook, Hirst & Co., Ltd., and J. A. Hirst. August 15th.
22,200. "Protective systems for polyphase alternating-current circuits." N. G. Langrish and Metropolitan-Vickers Electrical Co., Ltd. August 15th.
22,201. "Electric wave transmission systems." F. W. Le Tall (Westinghouse Electric & Manufacturing Co.). August 15th.
22,220. "Establishing high-voltage electric circuits." C. Dachary and L. Viquier. August 15th. (France, January 28th.)
22,245. "Electric light reflector for street name plates." E. G. Casey. August 15th.
22,251. "Valve wireless broadcast receiver." D. S. F. Adams. August 16th.
22,264. "Electric insulation." F. Hornby. August 16th.
22,265. "Inductance coils for wireless apparatus." F. Hornby. August 16th.
22,275. "Device for altering position of electric lamp, &c., suspended from cable, &c." A. T. Simpson. August 16th.
22,279. "System of securing proper earth connections on electrical machinery." F. W. Rowley and A. W. Williams. August 16th.
22,309. "Electric switches." J. B. Hansell and Metropolitan-Vickers Electrical Co., Ltd. August 16th.
22,314. "Telephone receivers." T. L. Jones. August 16th.
22,317. "Alternating electric current systems for motor vehicles." J. B. Bianco. August 16th.
22,321. "Control systems for electric arc welding apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). August 16th.
22,322. "Electro-magnetic devices." Western Electric Co., Ltd. (Western Electric Co., Inc.). August 16th. (United States, August 16th, 1921.)
22,323. "Telegraph systems." Western Electric Co., Ltd. August 16th.
22,324. "Electric lamp-holders and switches." H. Garde. August 16th.
22,326. "Sparking plugs." F. A. Coulson. August 16th.
22,328. "Electrically-operated driving and reversing mechanism." L. H. Bateman and Sir J. McKechnie and Vickers, Ltd. August 16th.
22,329. "Electrical transmission devices." Cibles Automatiques Michoud Soc. Anon. August 16th. (Switzerland, September 7th, 1921.)
22,335. "High-tension transformers." F. Dessauer and Veifa-Werke Akt. Ges. August 16th.
22,337. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. August 16th.
22,368. "Rotating field magnet for high-speed electrical machines." M. Gruber. August 17th.
22,416. "Electric switches." J. W. Cloud. August 17th.
22,419. "Strain insulators." British Thomson-Houston Co., Ltd. (General Electric Co.). August 17th.
22,430. "Electric lighting, &c., installations on railway, &c., vehicles." A. H. Darker and J. Stone & Co., Ltd. August 17th.
22,442. "Automatic, &c., telephone systems." B. B. Johnson and Relay Automatic Telephone Co., Ltd. August 17th.
22,456. "Manufacture of electric-incandescent lamps." M. P. Pedersen and N. F. Prass. August 17th.
22,468. "High-tension electric battery boxes." F. C. Hare. August 18th.
22,478. "Electrical system of railway signalling." W. Mears and T. Ruben. August 18th.
22,481. "Electric lighting and starting machines for motor vehicles." R. Bosch Akt. Ges. August 18th. (Germany, September 19th, 1921.)
22,500. "Electrically-controlled valve gears for reciprocating steam engines." O. Simmen. August 18th. (Germany, August 24th, 1921.)
22,522. "Process for capacitative compensation of alternating circuits." K. von Wysiecki. August 18th.
22,525. "Electric governor for prime movers." R. G. Jakeman and M. L. Kahn and A. H. Railing. August 18th.
22,526. "Electric governor for prime movers." M. L. Kahn and A. H. Railing. August 18th.
22,531. "Telephone transmitters." A. C. Ingle. August 18th.
22,532. "Electric cooking or heating devices." C. C. Armstrong. August 18th.
22,539. "Telephone mouthpieces." A. L. Mackay and P. S. O'Donnell. August 18th.
22,555. "Power transmission systems." Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric and Manufacturing Co.). August 18th.
22,558. "Power transmission systems." Westinghouse Electric and Manufacturing Co. August 18th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1921.

3,932. "Electric arc welding." A. E. White (International Welding Engineering Corporation). February 2nd, 1921. (183,876.)
4,381. "Wireless signalling systems and apparatus therefor." British Thomson-Houston Co., Ltd. (General Electric Co.). February 7th, 1921. (183,879.)
6,483. "Water-tight electric light fittings." J. Scott, Ltd., and J. Scott. February 26th, 1921. (183,884.)
9,385. "Regenerative control systems for electric motors." J. E. A. Michel. March 29th, 1921. (183,894.)
9,752. "Thermionic valves and like electric discharge apparatus." Mullard Radio Valve Co., Ltd., and S. R. Mullard. April 1st, 1921. (183,896.)
12,118. "Portable lamps." A. J. H. Haddan (Greist Manufacturing Co.). April 27th, 1921. (183,907.)
12,211. "Electric light shade or reflectors." F. Norke. April 28th, 1921. (183,909.)
12,224. "Time-controlled electrically-operated signal." J. H. Combs. April 28th, 1921. (183,911.)
12,227. "Protective devices for use with polyphase electric currents." N. G. Langrish and Metropolitan-Vickers Electrical Co., Ltd. April 28th, 1921. (183,912.)
12,270. "Electric switches." Metallurgique Electrique. October 29th, 1920. (170,820.)
12,364. "Electrical fitting connections." J. A. McKay. April 29th. 1921. (183,919.)
12,379. "Electric lighting, heating, and ventilating installations for railway and other vehicles, and secondary batteries for use in connection therewith." J. Stone & Co., Ltd., and A. H. Darker. April 29th, 1921. (183,920.)
12,656. "Electrical boiling rings." Electric Fires, Ltd., F. L. Newhouse, and C. H. Smith. May 3rd, 1921. (183,934.)
12,776. "Telephone exchange systems." Western Electric Co., Ltd., and L. Polinkowsky. May 4th, 1921. (183,939.)
12,791. "Apparatus for separating iron and other magnetically permeable metals from flour, grain, and the like." F. King. May 4th, 1921. (183,940.)
13,245. "Windings of alternating-current machinery." British Thomson-Houston Co., Ltd., H. W. Taylor, and F. H. Clough. May 10th, 1921. (Addition to 164,046.) (183,947.)
13,279. "Cut-out devices for magneto-electric machines." R. B. North and A. Massey-Allen. May 10th, 1921. (183,948.)
13,487. "Apparatus for protecting electric supply circuits comprising aerial lines." Akt. Ges. Brown, Boveri et Cie. May 15th, 1920. (163,308.)
13,516. "Attachment for use in connection with electric lamps, lamp-holders, and lamp shades." F. W. Salway. May 12th, 1921. (183,954.)
13,619. "Cooling arrangement for dynamo-electric machines." Metropolitan-Vickers Electrical Co., Ltd. May 17th, 1921. (163,315.)
14,066. "Protective devices for electric circuits." Metropolitan-Vickers Electrical Co., Ltd. June 9th, 1920. (164,728.)
14,194. "Miners' electric hand-lamps." A. H. Railing and A. E. Angold. May 21st, 1921. (183,959.)
14,555. "Electrical transmission over long distances." A. M. Taylor. May 25th, 1921. (183,964.)
14,672. "Electric switches." F. Lorand. May 26th, 1921. (183,968.)
15,430. "Electric switch operating mechanism." British Thomson-Houston Co., Ltd. (General Electric Co.). June 3rd, 1921. (183,978.)
15,460. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 30th, 1920. (165,782.)
15,520. "Electric measuring instruments." British Thomson-Houston Co., Ltd. (General Electric Co.). June 4th, 1921. (183,980.)
16,588. "Electro-magnetic wave-signalling systems." J. O. Mauborgne and G. Hill. June 16th, 1920. (165,038.)
16,782. "Electric relays." Siemens Bros. & Co., Ltd., L. De M. G. Ferreira, and J. Boot. June 8th, 1921. (183,990.)
17,813. "Gas impervious materials." British Thomson-Houston Co., Ltd. (General Electric Co.). June 30th, 1921. (184,012.)
17,997. "Manufacture of electric cables." J. Urmston & Callender's Cable and Construction Co., Ltd. July 2nd, 1921. (184,016.)
18,216. "Electric reactors." British Thomson-Houston Co., Ltd. (General Electric Co.). July 5th, 1921. (184,019.)
18,467. "Apparatus for suppressing arcs drawn across a given gap." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). July 7th, 1921. (184,026.)
18,651. "Railway signalling." F. Clarke. July 9th, 1921. (184,030.)
19,353. "Devices for raising and lowering trolleys in systems of electric traction with overhead conductors." R. Brooks, A. Priestley, and Metropolitan-Vickers Electrical Co., Ltd. July 18th, 1921. (184,038.)
19,359. "Means for securing windings in electrical transformers." Brush Etectrical Engineering Co., Ltd., and P. W. Scholefield. July 18th, 1921. (184,039.)
19,814. "Supports for electric resistances." Credenda Conduits Co., Ltd., and F. F. D. Davidson. July 23rd, 1921. (184,046.)
24,564. "Governor for controlling an electric motor or other prime mover for operating a pump to supply and maintain pressure in a hydraulic system." J. Stone & Co., Ltd., and W. P. Watkins. September 15th, 1921. (184,083.)
25,597. "Porcelain." British Thomson-Houston Co., Ltd. (General Electric Co., Ltd.). September 27th, 1921. (184,090.)
27,337. "Key contacts for electrically-operated organs and the like." J. H. Compton and F. A. Musgrave. October 14th, 1921. (184,098.)
27,788. "Telephone systems." J. E. Pollak (Siemens & Halske Akt. Ges.). October 19th, 1921. (184,100.)
31,936. "Overload switches for the protection of motors which are started by means of a starting resistance." F. Krupp Akt. Ges. December 30th, 1920. (173,487.)
34,138. "Mercury-vapour ejector air pumps." Akt. Ges. Brown, Boveri et Cie. December 31st, 1920. (Addition to 165,400.) (173,500.)

1922.

12,771. "Train-control systems and apparatus for use therewith." Automatic Telephone Manufacturing Co., Ltd., A. E. Hudd, and A. F. Bound. April 28th, 1921. (Divided application on 182,259.) (184,130.)